Alliance

Bioversity International

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

PABRA
Pan-Africa Bean Research Alliance
Better Beans for Africa

Schweizerische Eidgenossenschaft
Confédération suisse
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Swiss Agency for Development and Cooperation SDC

Improving food security, nutrition, incomes, natural resource base and gender equity for better livelihoods of smallholder households in sub-Saharan Africa

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Alliance of Bioversity International and the International Center for Tropical Agriculture (The Alliance)

Pan Africa Bean Research Alliance (PABRA)

By: Jean Claude Rubyogo

Bean Program Leader and Director
of Pan-Africa Bean Research Alliance (PABRA)

Reporting Period: 2015 -2020

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

ACRONYMS

AATF	African Agricultural Technology Foundation
ACIAR	Australian Centre for International Agricultural Research
ADEVEVI	Associations des vendeurs des Vivres.
ANCC	Area Nutrition Coordinating Committees
ASA	Agriculture Seed Agency
AVISA	Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa
BCMV	Bean Common Mosaic Virus
BDPEAE	Bureau de la Direction Provinciale de l'Environnement, de l'Agriculture et de l'Elevage
BMS	Breeding Management System
BSM resistance	Bean stem maggot resistance
CABI	Centre for Agriculture and Bioscience International
CADECOM	Catholic Development Commission in Malawi
CCA	Centre de Collect Agricole
CEDO	Community Enterprises Development Organization
CGA	Cereal Growers Association
CIS4B	Climate Information Services for Beans
CNRE	College of Natural Resources and Environment
COMSIP	Community Savings and Investment Promotion
CSA	Climate Smart Agriculture
DACA	Digital AgroClimate Advisory
DARS	Department of Agricultural Research Services
DERN	Development Rural pour le Nord
DLB	Demand Led Breeding
DR&SS	Department of Research and Specialist Services
DUS	Distinctness, Uniformity and Stability
EADCL	Eastern Agricultural Development Company Ltd
EASC	East Africa seed Company
ECABREN	East & Central Africa Bean Research Nework
ECABYT	ECABREN Bean Yield Trial
EIAR	Ethiopia Institute of Agricultural Research
EiB	Excellence in Breeding
FAO	Food and Agriculture Organization
Fe	Iron
FO	Farmer organization
FOMI	Fertilisans Organo-Mineral Industry
FSC	Farmer Support Center
FUM	Farmers Union of Malawi
GAPs	Good Agriculture Practice
GIS	Geographic Information System
Hamlets	Village
HI	Heifer International
HIB	High Iron Beans
IBP	Integrated Breeding Platform
ICM	Integrated Crop Management

ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Cooperation
IGEBU	Institut Geographique du Burundi
KADERES	Karagwe Development and Relief Services
KALRO	Kenya Agricultural Research and Livestock Organization
LER	Land Equivalent Ratio
LFSP	Livelihoods and Food Security Programme - Zimbabwe
LUANAR	Lilongwe University of Agriculture and Natural Resources
M&E	Monitoring and Evaluation
MATESEL	software package used to drive your breeding program
MCT	MultiCrop Thresher
MEASURE	Monitoring and Evaluation of Agri-Science Uptake in Research and Extension
NaCRRI	National Crops Resources Research Institute
NARS	National Agricultural Research Systems
NASFAM	The National Smallholder Farmers' Association of Malawi
NDBCT	National Dry Bean Cultivar Trial
OCS	Optimal Contribution selection
ODK	Open Data Kit
OFSP	Orange Flesh Sweet Potato
ONCCS	Burundian Authority Responsible for Seed Control and Certification
PABRA	Pan Africa Bean Research Alliance
PIC	Phaseolus Improvement Cooperative (
PICSA	*Participatory Integrated Climate Services for Agriculture*
PP	Product Profile
PVS	Participatory Variety Selection
QDS	Quality Declared Seed
RCBP	Rapid bean cooking project
SARBYT	Southern Africa Bean Yield Trial
SDC	Swiss Agency for Development and Cooperation
SFMT	Sehatra Fiaraha-Miasa Tsaramaso Vakinankaratra
SGS	Stage gate testing system
SIRP	Smallholder Irrigation Revitalization Programme
SMEs	Small and Medium Enterprises
SOPs	Standard Operating Procedures
TAAT	Technologies for African Agricultural Transformation
The Alliance	Alliance of Bioversity International & CIAT
ToT	Trainers of Trainees
UNICEF	United Nations Children Education Fund
UP	United Purpose
UWA	University of Western Australia
VNCC	Village Nutrition Coordinating Committee
WWF	World Wide Fund for Nature
Zn	Zinc

INTRODUCTION

In 2015, the Pan African Bean Research Alliance (PABRA) programme of the Alliance of Bioversity International and International Center for Tropical Agriculture (The Alliance) started implementing a project on **"Improving bean productivity nutrition, incomes, natural resource base and gender equity for better livelihoods of smallholder households in Sub-Saharan Africa".** The project was financially supported by the Swedish Development Corporation (SDC) supplemented with complementary investment from donor partners among them Global Affairs Canada (GAC), Africa Development Bank (AfDB), Bill and Melinda Gates Foundation (BMGF), Australian Centre for International Agricultural Research (ACIAR), International Development Research Centre (IDRC).

Burundi and Zimbabwe are the flagship countries for the current phase of the SDC support. These countries were chosen based on the unique challenges the countries experienced, necessitating investment to support them. Burundi was selected based on the challenges in the agricultural sector caused by political instability. PABRA's role was to support the revival of the bean research programme through capacity building, restoration of bean seed systems, and through intensifying links among actors in the bean value chain to boost bean production for improved food security, nutrition and incomes.

The SDC project in the Flagship countries and other PABRA countries seeks to address the following outcomes:

- **Intermediate Outcome 1:** Increased bean productivity
- **Intermediate Outcome 2:** Increased utilization of improved bean-based products for nutrition security
- **Intermediate Outcome 3:** Increased trade of bean products
- **Immediate Outcome 4.1:** Increased access to skills, information and knowledge providing enabling environment for bean research and development

This report highlights progress of achievement over the last six years 2015 – 2020 in Burundi, Zimbabwe and other PABRA countries.

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BURUNDI PROGRESS ON ACHIEVEMENT 2015 -2020

Executive summary

The common bean (*Phaseolus vulgaris* L) is the most important legume and a major staple food for the majority of the population in Burundi. It is the primary source of protein and other micronutrients, especially iron (Fe) and zinc (Zn). In Burundi, the production of common bean ranks among the top sources of livelihood because of its contribution to household food security and incomes for more than 90% of smallholder farmers. Much cheaper than meat, and high in protein content, common bean is often considered the "*meat of the poor*". The crop is the most traded commodity across the country, thus a source of income for many households, especially for women. Increasing bean production and marketing is therefore a potential entry point for raising incomes of farm households in Burundi, providing a solution to food insecurity, poverty and malnutrition.

Burundi and Zimbabwe are the flagship countries for the current phase of the SDC support. These countries were chosen based on the unique challenges the countries experienced, necessitating investment to support them. Burundi was selected based on the challenges in the agricultural sector caused by political instability. PABRA's role was to support the revival of the bean research programme through capacity building, restoration of bean seed systems, and through intensifying links among actors in the bean value chain to boost bean production for improved food security, nutrition and incomes.

In 2014 and line with the national objective to reduce poverty in Burundi, Institut des Sciences Agronomiques du Burundi (ISABU), the Alliance of Bioversity International and International Centre for Tropical Agriculture (The Alliance) through the Pan-Africa Bean Research Alliance (PABRA), developed a seven-year flagship project focused on enhancing bean production to fight rural poverty and food insecurity in the country. The project has been instrumental in implementing a vibrant bean sub-sector in Burundi, characterized by high productivity, increased bean consumption for food and nutrition security and increased bean trade – including active engagement of women and youth in value chains. The objectives of the project were to: 1) Increase access to quality seed of new and preferred bean varieties and complementary Integrated Crop Management (ICM) technologies for improved productivity; 2) Increase access to nutritious bean products for food and nutrition security; and 3) Increase access to markets for better household incomes. Launched in November 2015, and granted an additional year up to 2020, the flagship initiative has successfully achieved the planned objectives.

This report provides a synthesis of the interventions implemented by partners between 2015 and 2020, while contributing to the flagship project coordinated by ISABU:

- The number of released climbing bean varieties increased from 15 to 23, among them five bio-fortified varieties: MAC44, RWV1129, Muhoro, RWV1272 and MAC70.
- The number of agro-ecological regions producing climbing beans increased from 7 (to 10). This is due to the release of Medium Altitude Climbers (MAC) varieties. Out of eleven bean producing regions, only one region (Imbo) is not growing climbing beans.
- Production and consumption hubs of highly demanded and marketed bean varieties are known and organized into four bean corridors: yellow, sugar, red and red mottled bean corridors.
- The number of bean processing units increased from one, Totahara Ltd, to six – among them three are women owned. The units' process and sell on average 500 to 2,000 kilograms of composite bean flour per month, resulting in increased consumption of biofortified bean varieties and bean based products.
- The number of small and medium seed enterprises increased from 15 producing 10 tons in 2014, to 115 (55 of them women) producing 1,333 tons of certified and Quality Declared Seed (QDS) in 2020. These seed producers are interlinked through the operational provincial based bean platforms.

- 13 high-yielding bush and climbing bean varieties have been supplied to 198,164 bean-growing farmers at field demonstrations, field days and farm visits. More farmers accessed seed from local businesses.
- Bean yield increased from 0.7 to 1.5 tons per hectare in the six years.
- Annual bean production increased from 250,000 tons in 2014, to 406,000 tons in 2020.

As a result of the improved quality of bean varieties grown in Burundi, full adopters of improved varieties and complementary crop management obtain 33% more grain per kilogram of seed planted. Partial adopters harvest 26% more than what they would have harvested if they had planted landraces, making extra cash income available for households that can sell the surplus. Improved varieties are 73% more profitable than local varieties. Each Burundi Franc invested in cultivating one kilogram of improved varieties yields 2.2 Burundi Francs in return, while a non-adopter received 1.28 Burundi Francs (1 USD=1,944.5 FBU).

Project achievements to date (2015-2020)

The PABRA flagship Initiative for Burundi identified six areas of emphasis for transforming the bean sub-sector. They are: i) Expansion and adoption of climbing beans; ii) Seed production and delivery systems; iii) Bio-fortified varieties and nutrition; iv) Women's access to production resources and nutrition basic skills; v) Bean market and related support services; and vi) Capacity building of bean value chain actors.

More specifically, the project aimed to:

i. Expanding climbing bean technologies in agro-ecological regions of Burundi with similar agro-climatic conditions to those in Rwanda; and build on experiences in Rwanda to increase bean productivity at farm level;

ii. Strengthen seed production and delivery systems, engaging both public and private sector partners to incorporate various seed delivery options. For example, using smaller seed packs, leveraging decentralized seed entrepreneurs, particularly women, and exploiting already released high Iron and Zinc bean (HIB) varieties for wide dissemination in Burundi;

iii. Support nutrition initiatives linked to HIB varieties, and nutrition information;

iv. Increase access to production resources and basic nutrition skills for women;

v. Increase smallholder farmer access to profitable bean markets and related support services;

vi. Support capacity building for researchers, development partners, value chain actors and farmers to enhance relevant skills.

INTERMEDIATE OUTCOME 1: Increased bean productivity

TARGET 2015-2020 (a):

1,500 kilograms per hectare bean yield in Burundi

Progress: Bean yields per hectare doubled from 750 kilograms in 2014 to 1,500 kilograms in 2020 (Fig. 1). Increased yields have encouraged farmers to invest in good quality seed of high-yielding, market-preferred varieties, further propelling productivity through improved crop management practices.

Climbing beans can produce 2 to 3 times more yield than bush beans on the same plot (Katungi E; C. Larochelle, J. Mugabo and R. Buruchara, 2019). The reported yield of 1.5 tons per hectare is an average for both climbing and bush beans together.

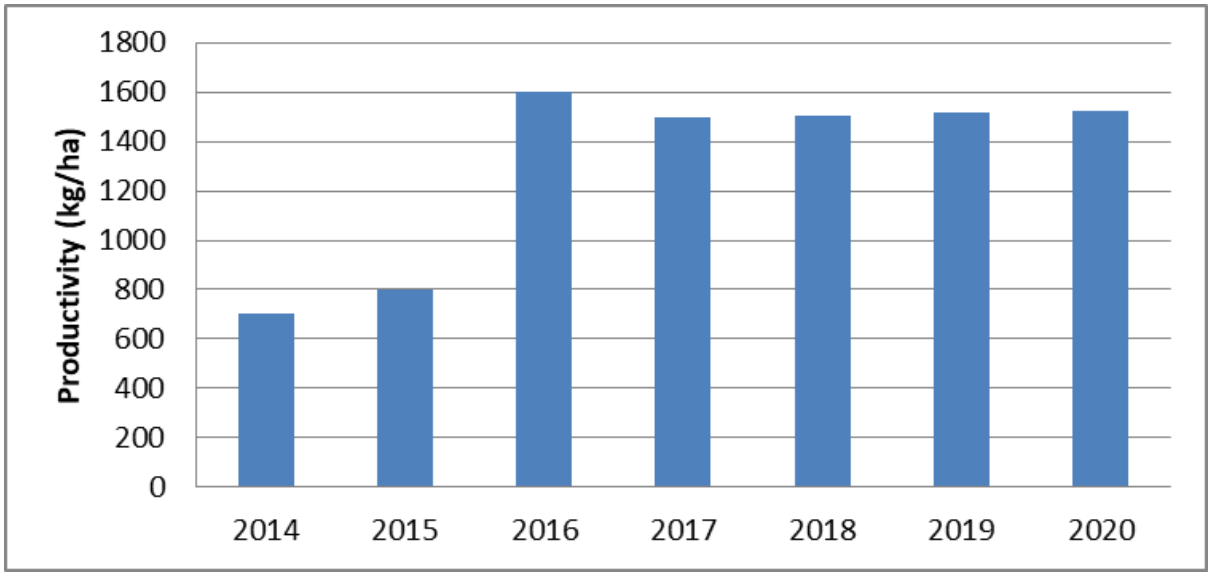


FIG. 1: Bean productivity in Burundi (kg/ha),2014-2020 – **Source:** FAOSTAT, 2019 ISABU, 2020. See also http://www.fao.org/faostat/en/#data/QC

TARGET 2015-2020 (b):

20% increase in area occupied by climbing beans in Burundi

Bush and climbing beans are two bean growth habits widely grown in Burundi. The country has 11 agro- ecological zones as indicated in Figure 2. In 2015, climbing beans were grown in seven agro- ecological regions namely Buyenzi, Kirimiro, Buyogoma, Mugamba, Buragane, Bututsi and Mumirwa. In 2020, three additional agro ecological regions of Bugesera, Bweru and Moso started growing climbing beans.

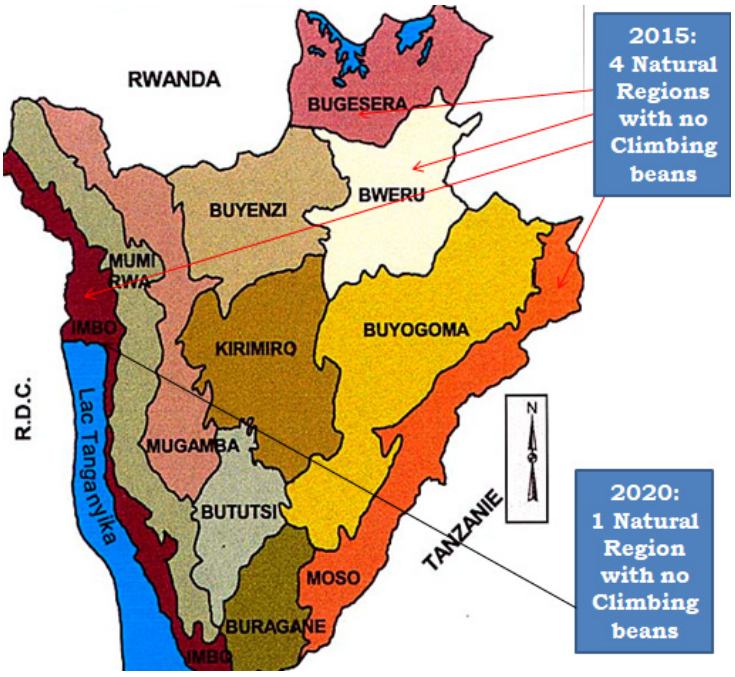


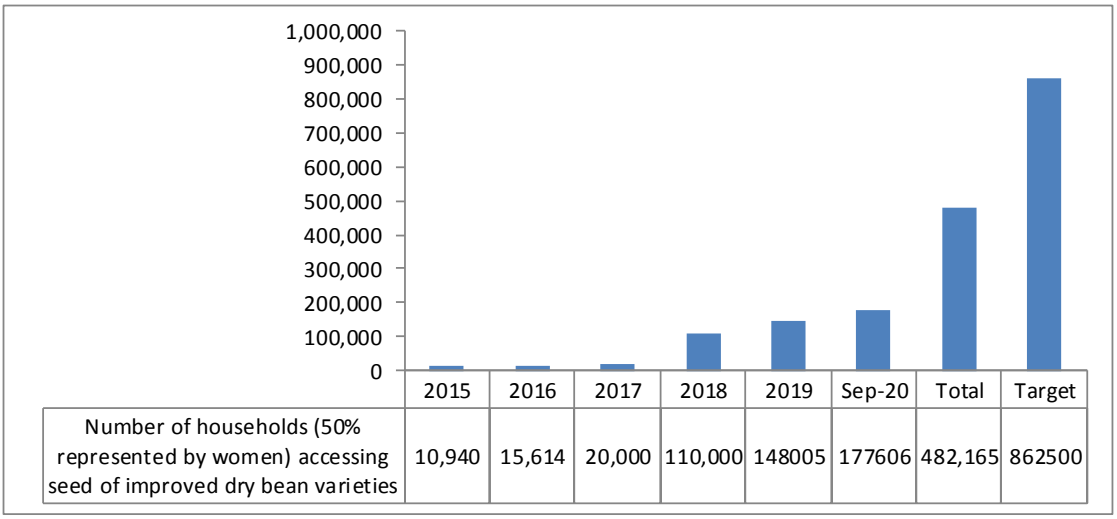
FIG. 2: Increase in number of bean-growing regions for climbing beans, 2015-2020 (authors).

IMMEDIATE OUTCOME 1.1: Increased and gender-equitable access to high-yielding dry bean varieties and productive Integrated Crop Management (ICM) technologies/information

TARGET 2015-2020 (a):

862,500 households accessing seed of improved dry bean varieties
862 500 households accessing ICM and labour-saving technologies.

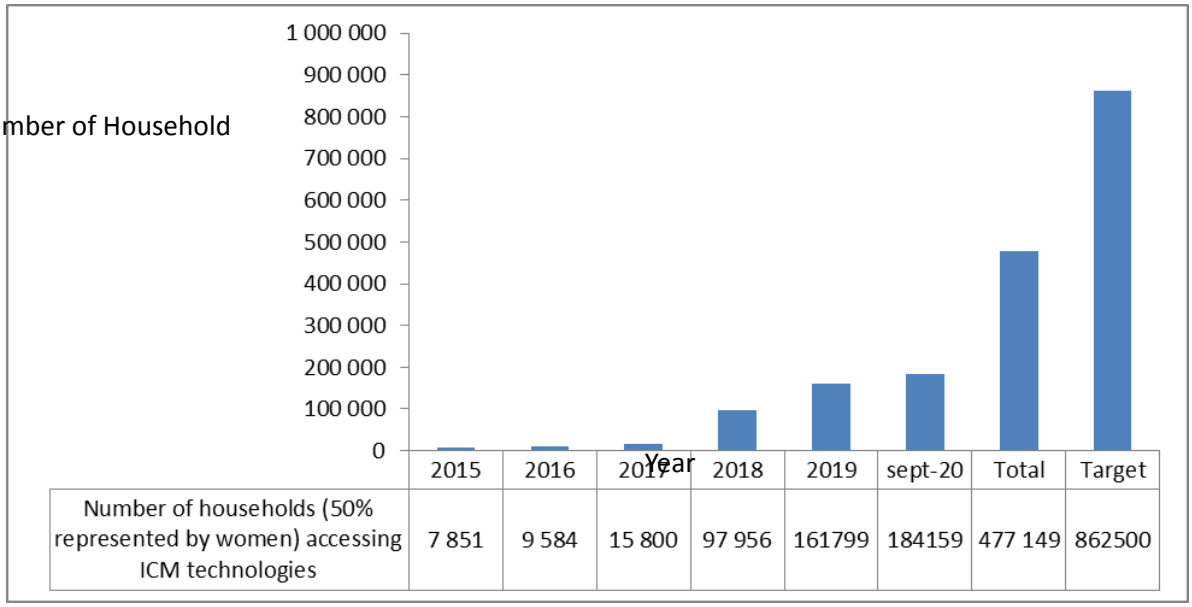
Progress: The number of households varied from one year to another. They are as follows: 2015: 10,940; 2016: 15,614; 2017: 20,000; 2018: 110,000; 2019: 148,005 and 2020: 177,606. From 2015-2020, a total of 482,165 households among them 250,762 women and 231,439 men accessed seed of improved dry bean varieties as indicated in Fig.3.



	2015	2016	2017	2018	2019	Sep-20	Total	Target
Number of households (50% represented by women) accessing seed of improved dry bean varieties	10,940	15,614	20,000	110,000	148005	177606	482,165	862500

FIG. 3: Number of households accessing seed of improved dry bean varieties, 2015 -2020.

The number of households accessing ICM technologies from 2015-2020 was 477,149, among them 248,177 women and 234,048 men: 2015: 7,851; 2016: 9,584; 2017: 15,800; 2018: 97,956; 2019: 161,799 and 2020: 184,159 as presented in Fig. 4. The ICM technologies are very important in Burundi taking into account the increasing demographic pressure that has caused acute land shortages, leading to the overexploitation and degradation of land.



	2015	2016	2017	2018	2019	sept-20	Total	Target
Number of households (50% represented by women) accessing ICM technologies	7 851	9 584	15 800	97 956	161799	184159	477 149	862500

FIG. 4: Number of households accessing ICM technologies

TARGET 2015-2020 (B):

575 households (50% represented by women) accessing labor saving technologies
500 women and youth accessing labor saving technologies

Progress: From 2015-2020, a total of 524 households accessed labor saving technologies. One of the labor saving technologies promoted in Rutana, Mwaro, Kirundo and Gitega was the multi-crop thresher (beans, maize, wheat and soybean among others). Three seed entrepreneurs named Gatabazi Jean, Rwasa Monique and Hatungimana Richard purchased the threshers to offer threshing services to other farmers. To date, five bean threshers have been made and are helping neighboring farmers of Rutana (75 men, 47 women), Mwaro (53 men, 30 women), and Gitega (42 men, 53 women) to thresh their beans (see Fig. 5). By 2020, a total of 279 men and 301 women had accessed this technology at fees. This makes post-harvest operations efficient. Normally beans are manually threshed by hand, and done by women. This is labor intensive and heavy drudgery for women.

FIG.5: Demonstration of using multi-crop bean thresher at Bwambarangwe commune (Kirundo province) and Bukemba (Rutana)

TARGET:

60% level of satisfaction with delivery systems for dry bean varieties, ICM and labor saving technologies

Progress: There is an increase in the level of satisfaction with delivery systems for dry bean varieties, ICM and labor saving technologies, from 45% in 2015-2018, to 61% in 2019 and 65% in 2020.

OUTPUT 1.1.1: Competitive high-yielding and stress-tolerant varieties developed across various agro-ecologies and cropping systems

TARGET 2015-2020:

Ten new preferred, high-yielding and stress-tolerant dry bean varieties released.

Progress: Between 2015 and 2020, the ISABU bean program exceeded targets by releasing 23 improved bean varieties (see Table 3). The characteristics of these varieties include resistance to various stresses and adaptation to different agro-ecological zones. The breeding also focused on developing climbing and bush bean varieties that require less land and are tolerant to soil-related constraints and drought. Two of the varieties are also resistant to root rot. In addition, ISABU submitted seven MAC and BFS varieties beans for release tests by the seed regulatory authority. The varieties released during the period of the project are presented in Table 1.

TABLE 1: Bean varieties released with good yield and tolerant to biotic and abiotic stresses in Burundi (2015-2020):

NO	OFFICIAL NAME	PURPOSE OF RELEASE	GROWTH HABIT	YEAR OF RELEASE	VARIETY SOURCE	YIELD POTENTIAL ON STATION (KG/HA)	YIELD POTENTIAL OF FARM (KG/HA)
1	MAC44	Nutrition	Climber	2015	CIAT line	2,500	2,000
2	RWV1129	Nutrition	Climber	2015	CIAT line	2,500	2,000
3	MAC70	Nutrition	Climber	2015	CIAT line	2,000	1,500
4	MUHORO	Nutrition	Climber	2015	Local landrace	2,500	1,500
5	RWV1272	Nutrition	Climber	2015	CIAT line	2,500	1,500
6	IZO201543	Market and resilience	Climber	2015	CIAT line	2,500	1,500
7	CODMLB003	Market and resilience	Bush	2015	CIAT line	1,200	800
8	RWR2245	Nutrition	Bush	2016	CIAT line	1,200	800
9	RWR2154	Nutrition	Bush	2016	CIAT line	1,200	800
10	GSZ611	Yield and resilience	Climber	2016	CIAT line	2,500	2,000
11	BCB-11-404	Canning/Market and resilience	Bush	2017	CIAT line	1,400	800
12	BCB-11-315	Canning/Market and resilience	Bush	2017	CIAT line	1,000	800
13	RWR1092	Root rot tolerant and resilient	Bush	2017	CIAT line	1,000	800
14	NUV30	Nutrition	Climber	2018	CIAT line	2,500	1,500
15	NUV91	Nutrition	Climber	2018	CIAT line	2,200	1,700
16	NUV130	Nutrition	Climber	2018	CIAT line	2,000	15,000
17	ECDHR	Root rot tolerant and resilient	Bush	2018	CIAT line	1,800	1,200
18	KENYA SUGAR	Market and stress resilient	Bush	2018	Local landrace	1,200	800
19	GISETSABAGORE	Market and resilience	Climber	2018	Local landrace	2,200	1,700
20	RUSENYANZEGO	Market and resilience	Climber	2018	Local landrace	2,000	1,500
21	JAUNE VOLUBILE	Market and resilience	Climber	2018	Local landrace	2,000	1,500
22	NOKIA	Yield and resilience	Climber	2018	Local landrace	2,500	1,800
23	KINURE	Market and resilience	Climber	2018	Local landrace	2,500	1,800

The breeding program prioritized attributes defined in line with different market classes (see Fig.6). The ISABU bean program focused on the following market segments:

- Large-medium yellow bean for disease tolerance;
- Large-medium red bean for low soil fertility and disease tolerance;
- Large-medium red mottled bean, biofortified for drought and disease tolerant;
- Large-medium sugar bean for the local market, biofortified for; drought and disease tolerant;
- Large-medium, kaki (bush bean: Mukungugu and M'sole) and other types (cream color: GSZ611 climber) and ECDHR (bush); White (BCB81013) climber bean for local market for low soil fertility and disease tolerance.

The varieties developed are selected based on their suitability for the market demand including nutrition quality, yields and climate change resilience (drought, disease and pest tolerance). Since 2017, product profiles for Burundi have been developed and varieties testing were aligned with the bean corridor approach (See annex 1).

FIG. 6: Bean varieties promoted in Burundi between 2015 and 2020.

The grain of these varieties is currently sold at local markets for home consumption (see Fig.7), demonstrating good impact in getting these new varieties to households. Before 2015, bean grains sold at local markets were a mixtures of different varieties. Farmers and traders have been trained to add value by selling grain without mixing varieties. In the past, yellow beans were sold at higher price compared to other varieties/types. However, currently when bean varieties are not mixed, they are sold at the same price as yellow beans.

FIG. 7: Market opportunities in Bujumbura market for yellow, sugar, red and red mottled bean varieties.

To support variety development and selection, ISABU has constructed two screen house facilities for breeding line development (Fig. 8). The first 10m x 30m screen house will enable researchers to cross varieties and assess common bean diseases like Angular Leaf Spot (ALS), Ascochyta, Anthracnose, Bean Common Mosaic Virus, and assess other attributes such as heat tolerance and drought tolerance. The second 6m x 12m screen house will be used to assess root rot diseases. Unfortunately, the COVID-19 pandemic affected the construction of these facilities, which are now expected to be finalized in 2021.

FIG. 8: Newly built screen houses under the Flagship Project support in Burundi.

In 2019 and 2020, the micronutrient profiling of all released bean varieties in Burundi allowed to select 15 HIB varieties in Burundi. Any variety whose total Iron and zin contents are equal or superior to the checks (MAC44 for climbers and RWR 2245 for bush) was identified as HIB variety. Some of the varieties were found to have high content of both Iron and Zinc, whereas others had either high Iron or high Zinc content (see Table 2). Some of the HIB varieties identified were released in the neighboring countries.

TABLE 2: Identified and released HIB varieties in Burundi

VARIETY	IRON CONTENT (PPM)	ZINC CONTENT (PPM)	TYPE	YEAR OF RELEASE	COUNTRY OF RELEASE
M'sole	61	34	Bush	2021	DRC
Moree88002	58	32	Bush	1997	DRC, Uganda
Musengo	59	33	Bush	2008	DRC
RWR2154	62	32	Bush	2016	Rwanda, Uganda, DRC
RWR2245	59	31	Bush	2016	Rwanda, Uganda
Mukungugu	59	30	Bush	2008	
IZO201299	59	33	Bush	2003	
IZO201560	56	32	Bush	Pre-release	
GLP2	50.8	35	Bush	2010	
MAC44	66	28	Climber	2015	Rwanda, Uganda
MAC70	66	29	Climber	2015	Rwanda
MUHORO	64	32	Climber	2015	
NAKAJE	73	29	Climber	2013	DRC
RWV1129	75	32	Climber	2015	Rwanda, Uganda
RWV1272	62	30	Climber	2015	Rwanda

Source of data: Micronutrient profile data recorded in 2018B, 2019A and 2019B cropping seasons conducted in Gisozi, Murongwe, Karusi and Bukemba.

These varieties were adapted to different environments to address demand across the country. They are also suitable for processing into bean-based products, and are already being used by five bean processors located in the four provinces of Bujumbura, Kayanza, Muyinga and Makamba.

OUTPUT 1.1.2: Effective and economically viable Integrate Crop Management (ICM) options identified and promoted for increased dry bean productivity and resilience

TARGET 2015-2020:

Five economically proven ICM technologies, including conservation agriculture, developed and promoted for increased dry bean productivity and resilience.

Progress: The released bean varieties are accompanied by several ICM technologies to improve production. The project developed conservation agriculture technologies for increased dry bean productivity and resilience. The ICM technologies promoted in Burundi under the project include: i) Use of woods and ropes stakes; ii) Use of Perdu Improvement Crop Storage (PICS) bags to reduce post-harvest losses; iii) Improved compost to generate organic manure on farm; iv) Use of combined organic and mineral fertilizers in bean production; (v) Use of traditional methods to control bean bruchids damage in the store; and (vi) Use of bean threshers.

In 2020, the ISABU bean program continued to promote ICM technologies that have increased bean productivity at household level despite COVID-19 prevalence in the country (see Fig. 10). However, government restrictions imposed to curb the spread of COVID-19 negatively affected bean production among farmers, as movement was restricted with enforced wearing of masks in public where people could not afford them. These directives limited labor availability for field activities and affected farmers' access to markets.

The ICM technologies, promoted through demonstration plots and farmer field schools, contributed strongly to increased bean production in the country. Farmers were trained in using new improved bean varieties, crop rotation, use of ropes and strings as an alternative option to stake climbing beans, and trained in how to produce organic manure using improved compost. They were also trained in the benefits of using Tithonia as green manure fertilizer; the combined use of mineral fertilizer and organic manure to increase production, and postharvest technologies and handling. Partners and farmers were also trained on land management and ICM options such as the use of conservation agriculture to improve resilience.

Success story: Parfait Uwimfura

Parfait Uwimfura, a seed entrepreneur in Muyinga province, is a registered seed producer since 2017. He is fortunate to be supported by his friend Serges Sayukubara for whom he works, to multiply basic seed to certified seed. In 2018, he produced 6.5 tons of Magorori (MAC44) beans, Rufutamadeni (CODMLB003) and Kaneza (RWR2245). Unfortunately, a lack of customers meant he was not able to sell the bean, and so he decided to approach farmers to buy seeds from him instead. In 2019, through a partnership with International Fertilizer Development Center (IFDC), he built a store for safer seed storage (see Fig. 9). In the same year, the government initiated *Sangwe* cooperative model for all the villages across the country. A good number of villagers from ten of these Sangwe cooperatives are already his customers. He is in the process of producing second category of certified seed (C2). At the beginning he was producing 2-4 tons of seed per year, but currently he has a capacity of producing 12-16 tons per year. To grow his seed business, Uwimfura also sensitizes and trains smallholder farmer members of the *Sangwe* cooperatives on the benefits of improved bean varieties. With the money from bean sales, he has now bought 4ha as additional land for bean seed production.

FIG. 9: Parfait Uwimfura selling seed in his rural agro-dealers shop

Success story: Nzirubusa Pascasie

Nzirubusa Pascasie from Ruhororo commune in Ngozi province, is a seed entrepreneur who was supported by the project to produce basic and certified seed during the second cropping season of 2020. She received 20 kilograms of Mutwenzi (RWV1272) variety, that she planted on a half-acre of her farm. She used organic manure combined with mineral fertilizer to cultivate the beans, and the crop did so well that she harvested more than 750 kilograms of bean seed. She sold 600 kilograms of her harvest to her neighbors and plans to plant the remaining seed in an area of three hectares on her farm. From the extra income she received from the bean sales, she has now bought a cow, 6 pigs and 20 chickens that she is rearing at home to make money and organic manure.

Success story: The ISABU bean program

The ISABU bean program is working with a private company, FOMI (Fertilisant Organo Mineral Industry), to enhance crop production (see Fig. 10). The FOMI brand is growing in popularity in Burundi, and the partnership is expected to enable a large number of farmers to access the new technology. The enterprise is producing a range of fertilizers such as FOMI IMBURA, which is a common fertilizer for legumes, FOMI BAGARA and FOMI TOTAHAZA for other crops such as maize and potato.

FIG. 10: Joint field evaluation on the performance of FOMI IMBURA on common bean production in the presence of the Minister of Environment, Agriculture and Livestock, Dr. Deo Rurema (May 2020).

In the 2019B and 2020A cropping seasons, ISABU bean program jointly conducted trials with FOMI to evaluate the performance of FOMI Imbura compared to DAP, which is popularly used brand of fertilizer in Burundi. The study was conducted both on station and at farmer level. Results obtained in ISABU experimental stations showed that average bean yields were not significantly different across treatments. Nevertheless, based on absolute yield values, the double FOMI-IMBURA application rate at 200 kilograms per hectare, as well as 100 kilograms per hectare of DAP and 50 kilograms of KCl gave lower bean yields comparatively to 100 kilograms per hectare of FOMI-IMBURA. In the farmers' fields, bean yields obtained from climbing beans fertilized with 150 kilograms per hectare of FOMI-IMBURA were higher in absolute values than those associated with 150 kilograms per hectare of DAP in 14 out of 17 provinces, although no statistical differences could be detected between the two treatments. However, 150 kilograms per hectare of FOMI-IMBURA gave significantly higher bean yields than 150 kilograms per hectare of DAP application rate in Bujumbura, Muyinga, Rumonge, Rutana and Ruyigi provinces. A similar trend was noticed with bush bean varieties in 16 out of 17 provinces, with the exception of Mwaro province where 100 kilograms per hectare of DAP gave higher yields than the equivalent rate of FOMI-IMBURA. Additionally, compiled yield data over all provinces and bean types, bushy and climbing, showed that the average bean yield was superior to the one obtained with 150 kilograms per hectare of DAP application rate. In conclusion, in ISABU experimental stations as well as farmers' fields, FOMI-IMBURA gave higher or at least equivalent bean yields to application of DAP. Consequently, FOMI-IMBURA organo-mineral fertilizer can replace DAP application in bush and climbing bean fertilization in Burundi. Therefore, 100 kilograms per hectare of FOMI Imbura was recommended for bush beans and 150 kilograms per hectare of FOMI Imbura was recommended for climbing beans. A cost–benefit analysis of these various fertilizers and their rates will be carried out in 2021.

Staking options

The bean program has evaluated the impact of stake height on common bean production in 2020. Our research has shown that stakes may boost economic returns by at least 20%. The best stake height identified for optimum economic return is between 2 to 2.5 meters in height. Staking options with string are a suitable alternative due to scarcity of wood staking materials. The use of string as staking material provides several advantages. String increases the flexibility of the bean crop, allowing it to grow taller and produce higher yields compared to wood stakes. Use of string also saves time during harvest, and reduces wood cutting for staking material. They are women friendly/less risky since they are easily available and easy to source. In 2020, farm demonstration plots were used to extend the knowledge to the wider community, reaching different provinces in Bujumbura rural area (Mugongomanga), Mwaro (Gisozi, Kayokwe, Bisoro), Gitega (Mutaho, Bugendana), Rutana (Giharo) and Makamba (Fig. 11). The cost-benefit analysis of these various staking options are going on and we be finalised in 2021.

Munezero Pascasie using sticks for staking MAC44, on his farm in Muyinga Commune (April 2020).

Ndayiragije Marie using string for staking MAC44 beans, on her farm at Rutana province (April 2020).

FIG. 11: On-farm evaluation of various staking options

Disease severity and incidence

With support from the project, integrated pest and disease management has been carried out (see Fig. 12). Bean diseases are among the major constraints affecting production.

FIG. 12: Major bean diseases scouted in 2020

Disease surveillance

Between April and May 2020, the ISABU phytopathology team carried out an assessment of disease incidence and severity across the bean corridors. A characterization was done indicating the prevalence of diseases in the following bean corridors, see table 3:

TABLE 3: Disease incidence observed in the corridors

PROVINCES/CORRIDORS	MAIN DISEASES OBSERVED
Karusi	Root rot, Anthracnose, Ascoshyta, BCMV, ALS
Kayanza	Root rot, Anthracnose, Ascoshytose
Muyinga	Root rot, Anthracnose, Ascoshyta, CBB
Ngozi	Root rot, Anthracnose, CBB
Bujumbura	Root rot, Anthracnose, Ascoshyta
Gitega	Root rot, Anthracnose, Ascoshyta, BCMV
Mwaro	Root rot, Anthracnose, Ascoshyta, BCMV
Rutana	Root rot, Anthracnose, Ascoshyta, BCMV

Postharvest handling technologies promoted in Burundi

PICS bags to control post-harvest losses and increase bean quality

In Burundi, harvest losses are severe during storage. The loss is mainly due to bruchid diseases, namely *Acanthoscelides obtectus* and *Zabrotes subfasciatus*. One of the post-harvest management technologies promoted is the use of PICS bags. Since May 2019, the Government of Burundi has decided to promote the use of PICS bag to control damage in the stores. A Memorandum of Understanding (MoU) was signed between the government of Burundi and Tanzania Portland Cement Company (TPCC), a private sector enterprise operating in Burundi that has a license to import from the Global PICS, and also to produce and sell PICS bags.

FIG. 13: Upscaling the use of PICS bag at community level to limit post harvest losses in Burundi

The government encourages the use of PICS bags by making them available tax-free. They were previously sold at approximately US$ 4.3 or more by retailers in different markets of Burundi. Currently, the product is sold by the extension services (BDPEAEs: Bureau de la Direction Provinciale de l'Environnement, Agriculture et de l'Elevage) at a price of around US$ 2.90, giving more farmers access to the products. In 2019, 58000 PICS bag were supplied from the enterprise to Burundi. Another set of 42000 PICS bag were supplied in 2020 because the first set was not finished. Several development partners with the ISABU support carried out several demonstration and trainings on the use of PICS bags have been conducted in Ngozi, Rutana, Gitega, Makamba, Cankuzo, Karusi, Muramvya, Bujumbura, Mwaro, Kayanza and Bubaza, where approximately 38,956 people (25,321 women and 13,635 men) were given information about the new technology–see Fig. 13.

CASE STUDY: Use of PICS bags (triple bag): an appropriate method to control bruchid in the store

FIG. 14: Ms Kabirori Regine (Ngazari) together with the DG of ISABU appreciate the positive effect of the use of PICS bag in her store

Since 2016, Kabirori Regine Ngazari, a young woman seed entrepreneur from Kirundo Province (see Fig. 13), has been producing bean seed with the support of ISABU and the TERIMBERE MURIMYI cooperative. Before, she used to produce mixed bean varieties which gave low yields and fetched low prices in the market. Her chance of meeting with Sezibera Juvenal, the president of TERIMBERE MURIMYI cooperative, opened up great opportunities. Juvenal linked her to Burundi bean value chain actors, and the cooperative connected her to ISABU bean researchers who provided her with some technical support in bean production. Before 2016, she recorded production of 1,250 kilograms of beans on her four hectare plot. Currently, in the same area using improved bean varieties, she is producing four to six tons of certified seed and more than three tons of breeder seed every season.

Due to the increased production, she opted to use PICS bags to control bruchids during storage (Figure 14). After a training organized by ISABU on the use of PICS bags to control bruchid damage, she bought five PICS bags that she used in the 20191A cropping season. Within six months, she was surprised to find that the bean seed was not attacked by bruchid. Next cropping seasons in 2019B, 2020A and 2020 B, she bought 20, 100 and 80 respectively. She is highly satisfied with the PICS bags and now she is advocating for her neighbours to use them as well. The use of PICS bag has allowed her to save money that was used to buy chemical products.

Climate information services

Through the bean platform, daily weather information – rainfall and temperature - was provided via WhatsApp groups. The weather information was sourced from the Institut Geographique du Burundi (IGEBU) meteorological department under the Ministry of Environment, Agriculture and Livestock. The climatic information was broadcasted through the national TV (RTNB) and through social media (see Fig.14 10). Farmers receiving this information used it to make decisions about which variety of bean to grow; strategies for water logging management in the field using raised beds; intensified pest and disease management; when to harvest and the best post-harvest management technologies to use. The information was disseminated in a video format and approximately 4,568,800 people were reached.

In 2020, a training on Participatory Integrated Climate Services for Agriculture (PICSA) was planned. Unfortunately, the COVID-19 pandemic did not allow movement for CIAT staff to train participants. Therefore, a virtual training on PICSA was given to ECABREN's countries later in August 2020.

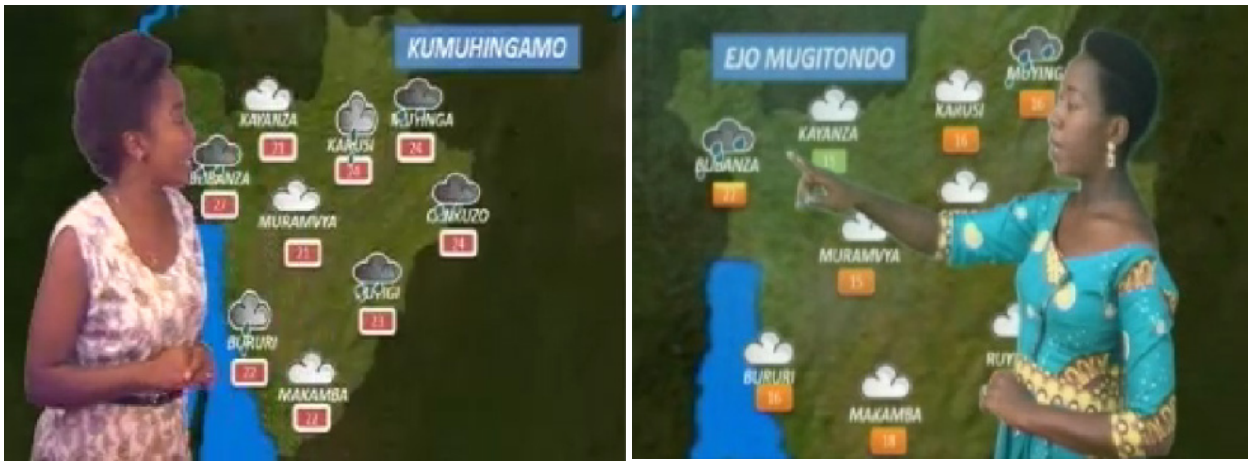


FIG. 15: Daily climatic information provided by IGEEBU, broadcasted through the national TV (RTNB) and through bean WhatsApp groups & other social media

OUTPUT 1.1.3: Gender specific labour-saving technologies validated

TARGET 2015-2020 (a):

Two gender-specific, labour-efficient techniques and technologies identified

Progress: To meet the target to supply two labor-saving technologies, a bean thresher was made in 2019 by PABRA in partnership with the Missouri State University (soybeaninnovationlab). A training was organized for 20 private artisans (including two women) from Burundi, to locally make and service low-cost bean threshers (see Fig. 16).

In 2020, PABRA supported three private sector partners, Gatabazi Jean, Hatungimana Richard and Rwasa Monique, in purchasing multi-crop threshers. At the end of 2020, the Director General of ISABU officially launched the use of thresher at community level in Bwambarangwe commune. Participants included extension staff and farmers neighboring the seed entrepreneurs. A total of 148 farmers participated among them 61 men, 87 women. In Makebuko commune, a total of 95 farmers participated, 42 men, 53 women. In Vumbi commune, 132 famers participated, 48 men,84 women. At Gisozi, a total of 122 farmers have been using the technology during 2020 where 75 were men and 47 women. Also in Gisozi, 83 farmers benefited the use of the bean thresher where 53 were women and 30 men.

FIG. 16: Training local artisans to make multi-crop threshers

The community neighboring seed entrepreneurs appreciated the value of the machines. Currently, they pay for threshing services to reduce drudgery.

TARGET 2015-2019 (b):
Levels of satisfaction with the labour saving technologies

TARGET 2015-2020 (a):
50% or higher levels of satisfaction with the labour saving technologies

Progress: In general, the high level of satisfaction (90%) among farmers concerning the multiple-crop threshing machines was influenced by reduced drudgery, particularly for women since they do most of the post-harvest operations. The machine is well appreciated at community level since besides being labor-saving it also saves money and human effort.

OUTPUT 1.1.4: Gender responsive delivery systems for seed of preferred dry bean varieties

TARGET 2015-2020 (a):
750 tons of new bean varieties produced and disseminated

Progress: From 2015-2020, both certified and Quality Declared Seed (QDS) have been produced to increase bean production. Production of seed increased from 175.575 tons in 2015 to 1,345.12 tons in 2020. The high quantity of seed produced can be explained by the increased number of seed producers. The target during this period was exceeded four times (See table 4). Consequently, it has been observed the increased access to quality seed of improved bean varieties has been key to increased productivity, food and nutrition security and additional incomes.

TABLE 4: Certified and Quality Declared Seed produced and disseminated in Burundi (2015-2020):

	PROGRESS MADE 2015-2020 (TONS)								% CONTRIBUTION TO TARGET
	2015	2016	2017	2018	2019	2020	TOTAL	TARGET 2015-2020	
Certified and QDS	175.575	228.905	445.991	596.1	995.4	1,345.121	3,787.092	862.5	439

Distribution of bean seeds producers across the country

The increase in production and dissemination was due to the effective and positive partnerships between ISABU and partners involved in the seed production system such as Office National de Contrôle et de Certification des Semences (ONCSS), Ministère de l'Environnement, de l'Agriculture) (Burundi) (MINEAGRIE)– DPSP project, Collectif des Coopératives et Compagnies des Producteurs des Semences du Burundi (COPROSEBU,) International Fertilizer Development Center (IFDC), Institut des Sciences Agronomiques du Burundi (ISABU), COPROSEB, Appui au Drveloppement Integral et a la Solidarite sur les Collines (ADISCO), RESEAU BURUNDI 2000+, World Vision, Catholic Relief Services(CRS), IFDC, Burundi-Value Chain Development Programme - PRODEFI, Fondation Stamm, TUBURA one acre, Fondation Stamm, CARITAS Burundi, PRODEFI, Seed producers and Farmers' cooperatives and associations. The increased number of seed producers from 15 producers in 2014 to 105 producers in 2020 has contributed to increased access to improved bean varieties (Figure 17).

The additional seed producers have contributed to a consistent increase in the volumes of different classes of seed produced over the years (Table 5; Figure. 17).

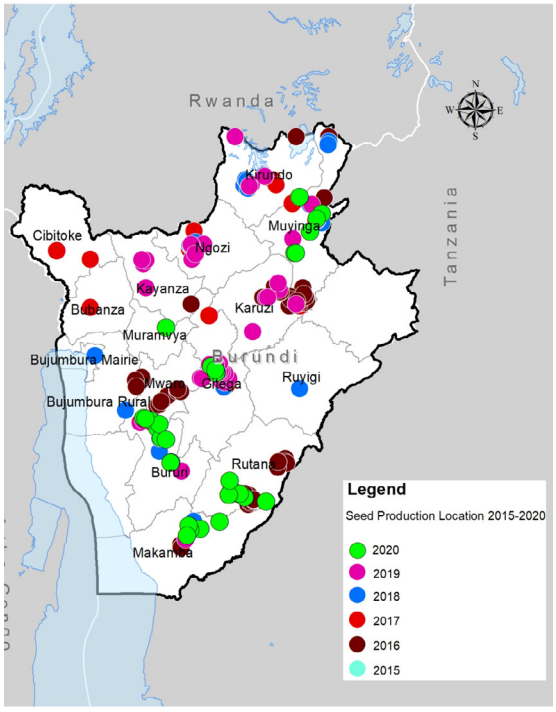


FIG. 17: Distribution of bean seed producers

TABLE 5: Trend of bean seed production before and during the flagship implementation:

YEAR	QUANTITY OF SEED PRODUCED IN TONS					
	NUCLEUS	BREEDER	PRE-BASIC	BASIC	CERTIFIED	QDS
2012	0	1.769	4.86	0	9.032	14.278
2013	0	3.83	2.456	0	4.571	23.445
2014	0	4.58	3.63	0	12.232	13.794
2015	0.23	2.911	3.217	24.326	4.675	170.9
2016	0.359	3.3495	3.63	43.542	35.779	193.126
2017	1.066	3.536	18.12	56.979	267.993	177.998
2018	1.27	4.942	23.084	138.3	482.259	113.841
2019	2.867	6.883	36.842	121.8	987.9	7.5
2020	1.811	3.098	27.650	164.508	1325.376	19.745
Total	7.603	34.819	123.489	549.455	3129.816	734.627
Target 2015-2020	6	30	110	500	2000	600
% target contribution	126.7	116	106	109.8	125.1	122.4

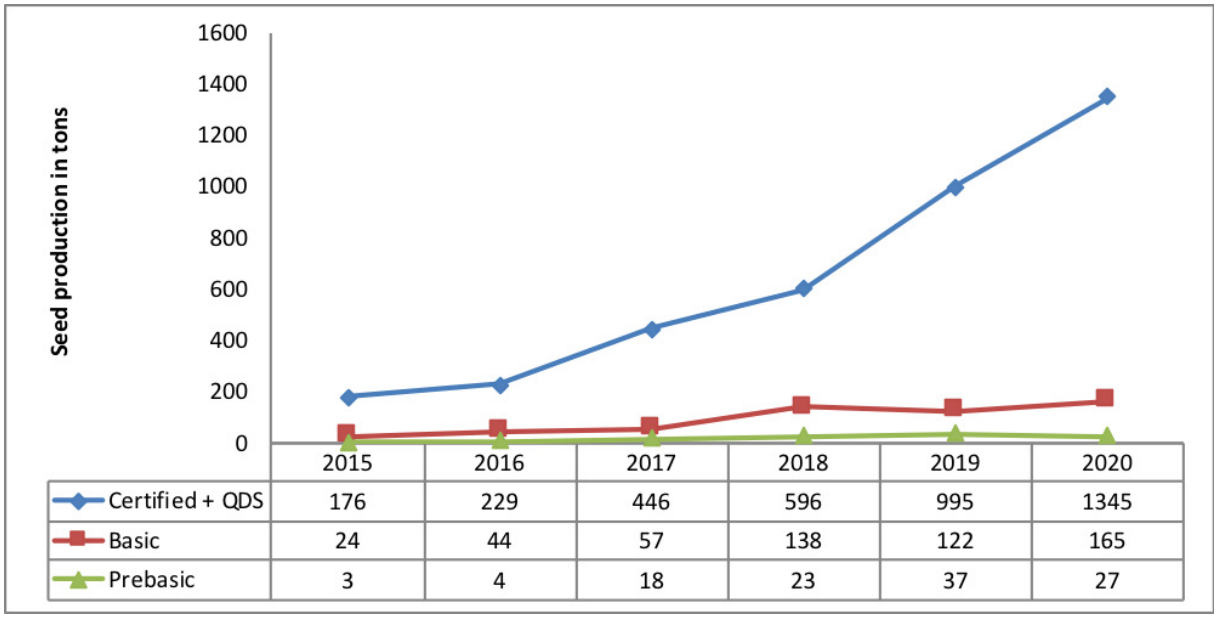


FIG. 18: Trend of production and marketing of various seed grades

The low pre-basic seed production recorded in 2020 compared to 2019 was due to climatic variability. High precipitation observed in December 2019 and April 2020 affected seed production in Gisozi, Murongwe and Bukemba site (Fig. 19).

FIG. 19: Flooding in Murongwe and Bukemba sites destroyed seed multiplication during the 2020B cropping season.

TARGET 2015-2020 (b):

Four delivery systems used for dry bean seed and Integrated Crop Management (ICM) technologies to reach men and women end users.

Progress: From 2015-2020, Burundi has promoted three out of a target of four innovative seed and ICM delivery systems. Those innovative seed and ICM delivery systems are highlighted below:

i) Use of small package sizes for increased sales of high-quality bean seeds

The project deployed various channels and approaches to deliver seed to farmers and support partnerships to reach scale. In 2019, a new innovation selling beans in small packs was initiated in Muyinga province, especially in Rugari Zone, in partnership with World Vision International (WVI), the IFDC and Office National de Contrôle et de Certification des Semences (ONCCS). This approach was introduced by ISABU as a learning experience from other PABRA member countries. Currently, the number of seed entrepreneurs selling in small packs has increased by 10% selling 30% of bean seed, thus reaching farmers with different purchasing power.

CASE STUDY

Between March and October 2020, Sayukubara Serges, Bakame Pancrace, Uwimfura Parfait, Kabiror Regine and Ntirampeba Marrieta sold bean seed in small packs. These seed entrepreneurs are located in Muyinga and Kirundo provinces and are working in close collaboration with ISABU, ONCCS and World Vision. The commercialization of small two and five kilogram seed packs has facilitated smallholder farmer access to improved bean varieties, while big bags of 50 and 100 kilogram seeds were sold to farmer cooperatives, seed entrepreneurs and other pilot farmers. The quantities of seed sold to farmers in small packs by different seed enterprises were as follows:

- ✓ Sayukubara Serges: 6.7 tons of certified seed
- ✓ Bakame Pancrace: 8.4 tons of certified seed
- ✓ Uwimfura Parfait: 5.4 tons of certified seed
- ✓ Kabiror Regine: 1.65 tons of certified seed
- ✓ Ntirampeba Marrieta: 6.9 tons of certified seed

Ntirampeba Marrieta and Uwimfura Parfait were supported by IFDC to build a village seed selling point. This has promoted access to improved bean varieties. The varieties promoted by these seed entrepreneurs were CODMLB003 (Rufutamadeni), RWR2245 (Kaneza), MAC 44 (Magorori) and Mukungugu (see Fig. 20) .

FIG. 20: Sale of bean seed through rural agro-dealer shop

ii) Delivery of seed, sensitizing and training on ICM and seed business management

Between 2019 and 2020, the ISABU bean program conducted two trainings on agribusiness in Bujumbura and Cankuzo province (Figure 21). A total of 63 participants, 47 men and 16 women, attended the training, conducted during the COVID-19 pandemic period aimed to empower seed entrepreneurs on how to make bean seed business profitable. The participants trained promised to train members of their cooperatives to produce the required quality and quantities of seed for purposes of generating income.

FIG. 21: Training of seed producers on efficient seed business management at Cankuzo province (Dec 2020).

iii) Creating a network of seed producers and enhancing their capacity on quality seed production and marketing
With support from the project, a bean multi-actor business platform was established in 2018. The objective was to strengthen links between actors working in bean production, distribution and consumption hubs and to improve efficiencies. The bean platform was used as a forum for seed entrepreneurs to advertise their products. Climate and seasonal information was also provided through the platform. To create awareness on seed production and availability during the COVID-19 pandemic, WhatsApp messaging and phone calls were used.

INTERMEDIATE OUTCOME 2: Increased utilization of improved bean-based products for nutrition security

TARGET 2015- 2020 (a):
287,500 households utilizing biofortified bean varieties

Progress: By 2020, a total of 248,864 households were reached with biofortified bean varieties, representing a contribution of 86.5% towards the target (Fig. 22).

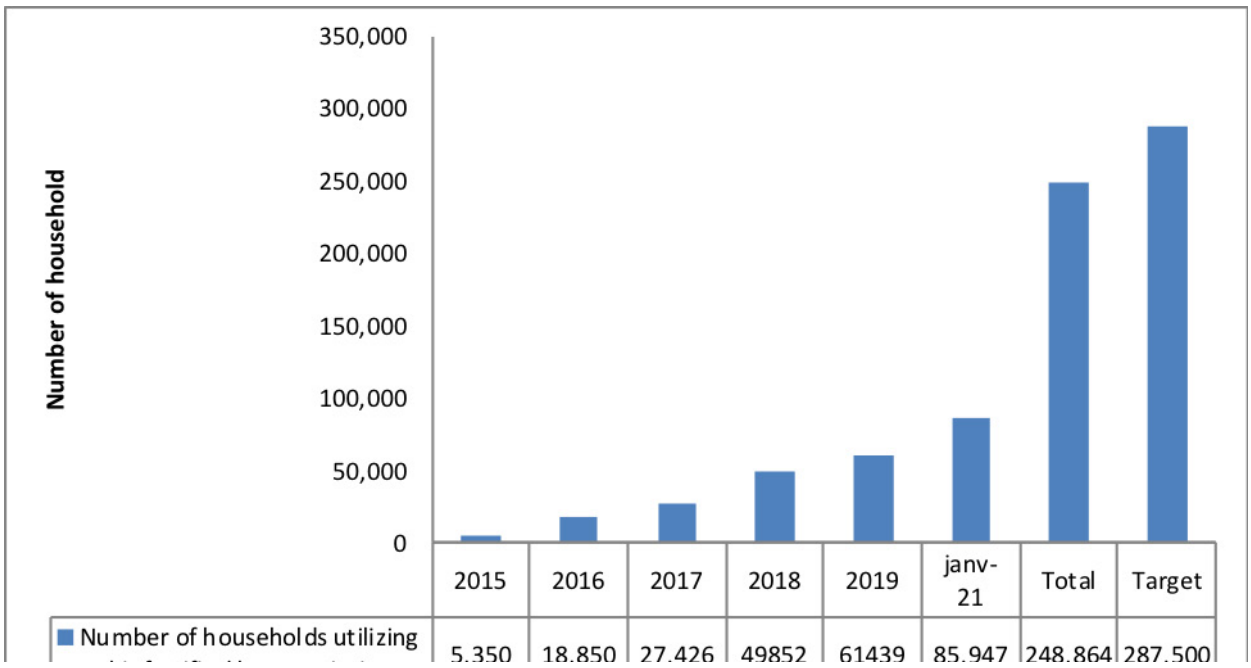


FIG. 22: Number of households utilizing biofortified bean varieties from 2015-2020

Before 2015, only two provinces (Muyinga and Kirundo) were growing HIB bean varieties. By 2020, the number of provinces growing biofortified bean varieties had expanded to more eight provinces (see Fig. 23)

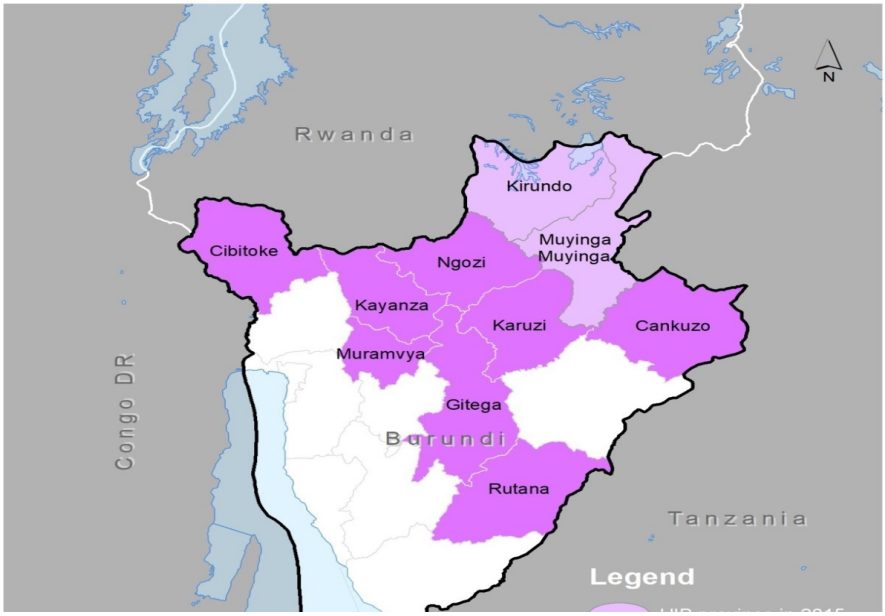


FIG. 23: Area covered with biofortified bean varieties (2015-2020)

TARGET 2015-2020 (b):

2,300,000 beneficiaries comprising of men, women and children consuming bean-based processed products.

Progress: By 2020, the number of beneficiaries comprising of men, women and children consuming bean-based processed products was exceeded by 138.6% (See Table 6). During the five-year period of project implementation, the major bean-based product promoted was bean composite flour. In addition, several other bean-based products were processed and commercialized including: bean porridge, doughnuts (mandazi), bean puree, bean cake, bean-biscuits and bean-croquettes.

TABLE 6: Consumers using bean-based bean products in Burundi (2015-2020)

PRODUCT	INDIVIDUALS CONSUMING BEAN-BASED PRODUCTS 2015-2020								% CONTRIBUTION TO TARGET
	2015	2016	2017	2018	2019	2020	TOTAL	TARGET 2015 - 2020	
Bean flour	156,059	378,453	540,500	558,652	751,667	802,446	3,187,777 (52.7% women)	2,300,000	138.5%

In 2020, PABRA supported Totahara Ltd by cost sharing (25%) new equipment to enhance quality and increase the quantity of products. From 12 tons of composite flour that Totahara Ltd was producing in 2019, the quantity increased to 20 tons per month (Figure 24).

FIG.24: Producing quality and quantity at TOTAHARA factory with new equipment

In response to COVID-19 pandemic in December 2020, PABRA with SDC support provided Karame Bean Flour (KAFLOBE) a milling machine factory by cost sharing ~~p~~ to enhance production. Overall, the COVID-19 pandemic negatively affected bean processors as consumers' incomes reduced, especially in urban areas, limiting capacity to buy the processed bean products and DRC market was closed too.

Between 2019 and 2020, about 2,500 mothers and children from five communities in Karuzi province participated in cooking demonstrations organized by World Vision Burundi in collaboration with ISABU. Participants learnt how to prepare bean composite flour and bean-based porridge as a nutritious meal that can be produced locally.

IMMEDIATE OUTCOME 2.1: Increased access to micronutrient rich bean products among the vulnerable groups in a gender equitable manner

TARGET 2015-2020 (a):

50,000 households accessing biofortified bean varieties

Progress: Between 2015 and 2020, a total of 85,581 households had accessed biofortified bean varieties, among them 48% were women-led, (See Table 7) exceeding the target (148.8%). Bean processors, especially Totahara Ltd and KAFLOBE, are promoting consumption of the bean based products by making them available through distributors.

TABLE 7: Number of households accessing bio fortified bean varieties.

	HOUSEHOLDS ACCESSING TO BIOFORTIFIED BEAN VARIETIES 2015-2020								% CONTRIBUTION TO TARGET
	2015	2016	2017	2018	2019	2020	TOTAL	TARGET 2015 - 2020	
Number of households accessing to biofortified bean varieties	7,851	9,584	14,000	14,201	19,122	20,823	85,581	57,500	148.8%

OUTPUT 2.1.1: Micronutrient rich bean varieties with superior agronomic traits released

TARGET 2015-2020 (a):

Five bio fortified bean varieties released

Progress: Between 2015 and 2020, Burundi released ten biofortified bean varieties (See Table 8). All varieties originated from CIAT genetic materials except Muhoro.

TABLE 8: HIBn varieties released in Burundi, 2015-2020

OFFICIAL NAME	GROWTH HABIT	YEAR OF RELEASE	YIELD POTENTIAL (ON STATION)	YIELD POTENTIAL (ON-FARM)
MAC44	Climber	2015	2500	2000
RWV1129	Climber	2015	2500	2000
MAC70	Climber	2015	2000	1500
RWV1272	Climber	2015	2500	1500
RWR2245	Bush	2016	1200	800
RWR2154	Bush	2016	1200	800
NUV30	Climber	2018	2500	1500
NUV91	Climber	2018	2200	1700
NUV130	Climber	2018	2000	1500
Muhoro	climber	2015	2500	1500

TARGET 2015-2020 (b):

500 tons of new HIB seed varieties produced and disseminated by partners

Progress: The production of seed of HIB varieties remains crucial as there is need to satisfy the demand from seed producers and NGOs who are supporting vulnerable groups. Between 2015 and 2020, 1,427.3 tons of certified seed and 304.6 tons of QDS of HIB varieties was produced to address malnutrition and respond to the high demand of bean processors.

TABLE 9: Certified seed and QDS of HIB bean varieties produced in Burundi (2015-2020)

SEED GRADE	PRODUCTION (TONS) BY YEAR								% CONTRIBUTION TO TARGET
	2015	2016	2017	2018	2019	2020	TARGET 2015-2020	TOTAL	
Certified	39.01	50.87	99.11	132.46	427.581	678.3	400	1427.331	356.8
QDS	19.51	25.43	49.55	198.69	3.027	8.4	100	304.607	304.607
Total	**58.52**	**76.3**	**148.66**	**331.15**	**430.608**	**686.7**	**500**	**1731,938**	**346.38**

OUTPUT 2.1.2: HIB bean-based products and tools adapted, developed and promoted

TARGETS: 2015-2020 (a):

Two best-bet products developed through private sector engagement

Progress: Consumers ranked bean flour as the most preferred product due to its versatility, convenience and nutritional value. Among the products made from bean flour, they ranked the porridge first, followed by doughnuts (*mandazi*). Six bean processors from four provinces, namely TOTAHARA in Bujumbura, KAFLOBE in Bujumbura, Rengerubuzima in Kayanza, Ifu y'ibiharage in Gashikanwa of Ngozi province, Ifu y'Ibiharage in Vumbi commune of Kirundo province and TUBEHO NEZA of Makamba commune, were engaged in processing bean flour, while food vendors in the open markets mostly produce bean doughnut (*mandazi*).

TARGETS: 2015-2020 (b):

One tool - recipe book and nutrition handbook - developed and promoted

Progress: In 2020, a policy brief on nutrition was developed and will be published in 2021 (https://www.researchgate.net/publication/349836146_Biofortified_Beans_A_vehicle_for_improving_Nutrition_Income_and_Food_Security_in_Burundi). The policy brief targeting government & and development partners and private sector advocates for promotion of bean-based products already developed including HIB and bean based processed products. In addition, five trainings for trainers on nutrition, diversity of bean recipes and promotional strategies were conducted between 2015-2020.

OUTPUT 2.1.3: Nutrition-sensitive approaches that support the utilization of bean-based products validated and promoted

TARGET 2015-2020:

Three approaches validated and promoted (e.g. Food basket approach)

Progress: Three approaches have been developed with various partners depending on the bean-based products and the context:

i) In 2020, World Vision Burundi initiated a new project - HIB Value Chains for Improved Maternal and Child Nutrition(B4MCN) using a community based crèches The project aims to enhance food security and nutrition especially for vulnerable groups such as children under five and breastfeeding mothers). Between 2017 and 2020, the project promoted two HIB varieties (MAC44 and RWR2245) in three provinces; Karusi, Muyinga and Kirundo. A total of 60 community crèche are supported to feed malnourished children (See Figure 25).

FIG. 25: Children being fed in the community creches organized with World vison

ii) Training on nutrition continued in 2020 through partnerships between the Ministry of Health - Programme National Intégré pour l'Alimentation et la Nutrition (PRONIANUT), the Ministry of Agriculture, Livestock and Environment and the nutrition-based development programmes. Efforts were made to increase the number of HIB varieties to alleviate malnutrition. The varieties are adapted in various environments and can be used to develop bean based products that are consumed at community level (see Fig. 26)

FIG. 26: Training of trainers at community level on how to prepare bean based porridge and bean porridge tasting by children in the communities

OUTPUT 2.1.4: In-country nutrition strategies influenced and availability of biofortified bean-based products facilitated

TARGET 2015-2020:
One policy brief

Progress: Apart from traditional ways of cooking beans such as boiling, ISABU bean program has conducted several trainings on how to prepare nutritious bean products. There is a plan to develop a recipe book in 2021. A policy brief has been developed, printed and distributed by the Alliance and ISABU bean program team (for more details - see page 26 output 2.1.2).

INTERMEDIATE OUTCOME 3: Increased trade of bean products

TARGET 2015-2020:

300,000 MT Volume of improved dry bean varieties traded

Progress: 406,200 MT (FAO-ISTEEBU)-2020

In the current year, the volume of beans traded was 81,000MT. This was a reduction form 123,830MT traded in the previous year in the country. The reduction in the traded volumes follows the trend in the reduced production over the year. The reduction is attributed to the effects of Covid-19 pandemic that impacted producers as well as traders. More producers may have reduced marketed volumes to preserve food in the face of uncertainties due to the pandemic. Trade may also have declined due to closure of borders as part of Covid-19 mitigation measures thus curtaining regional trade in beans.

IMMEDIATE OUTCOME 3.1: Increased access to profitable local and national markets in a gender equitable manner

TARGET 2015-2020 (A):

287,500 households selling to profitable markets

Progress: Over the years, the number of households selling beans to profitable markets reached a total of 564,247, representing 196% of the target (See table below), among them 42.5% women.

TABLE 10: Number of households selling beans to profitable markets in Burundi (2015-2020)

	HOUSEHOLDS SELLING BEANS TO PROFITABLE MARKETS								% CONTRIBUTION TO TARGET
	2015	2016	2017	2018	2019	2020	TOTAL	TARGET 2015 - 2020	
Number of households selling beans to profitable markets	43,834	47,812	149,334	70,520	114,885	137,862	564,247	287,500	196

Commercialization of improved bean and bean composite flour is mainly done by women in rural and peri-urban areas. Women participated in an agri-fair to exhibit their products, and create awareness to the community (See Figure 27).

FIG. 27: Commercialisation of bean based products by women for income generation via 20 cooperatives supported by World Vision Burundi

The Corridor approach contributed to increased number of households selling to more profitable markets for value addition. Gitega and Bujumbura are the major consumption hubs in Burundi whereas Kirudo, Muyinga, Karusi,

Rutana and Makamba are major production hubs. When there is a surplus of bean produced in Burundi, the beans are sold in the Democratic Republic of Congo, and when there is low production, Burundi is supplied from the Western part of Tanzania (See Figure 28).

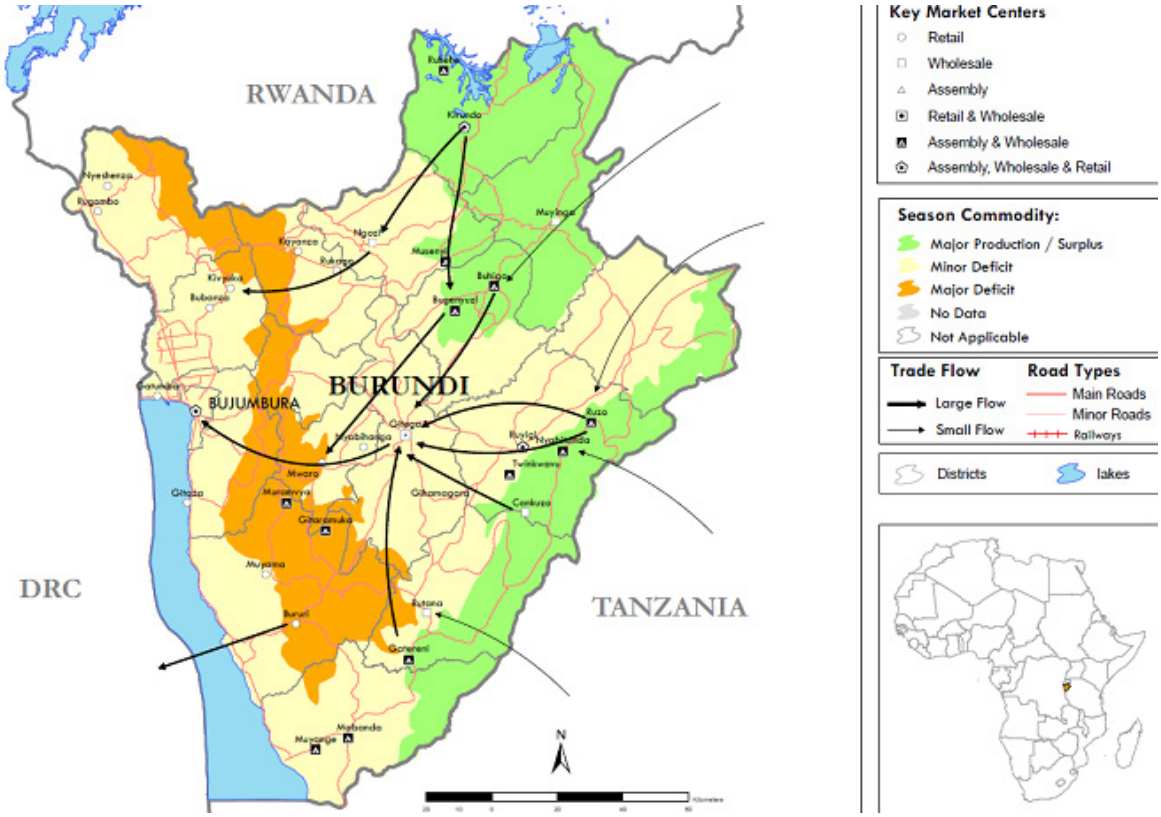


FIG. 28: Bean flows from production hubs to consumption hubs

TARGET 2015-20 20 (b):

115,000 consumers accessing processed products

Progress: Between 2015 and 2020, 188,137 households consumed value-added products, contributing to the target of 163.5% (see Table 11). Processors are producing bean-based products that are being packed in bags of 1 kilogram. From the six bean processors that are operating in Burundi, more than 400 tons of bean flour was produced between 2017 and 2020.

TABLE 11: Number of households accessing and consuming value-added products in Burundi (2015-2020)

PRODUCT	HOUSEHOLDS CONSUMING VALUE-ADDED BEAN PRODUCTS 2015-2020								% CONTRIBUTION TO TARGET
	2015	2016	2017	2018	2019	2020	TOTAL	TARGET 2015-2020	
Bean flour	15,271	17,000	22,000	31,854	46,369	55,643	188,137	115,000	163.5

The processed bean-based products are being disseminated widely across the country. For instance, TOTAHARA is covering Bujumbura, Gitega, Muyinga, Ngozi, Kirundo and Karusi provinces with average production estimated at 20 tons per month. KAFLOBE and RENGERUBUZIMA are supplying Bujumbura, Kayanza, Ngozi, Muyinga, Mwaro and Rumonge with an average of 7.5 tons per month. KAFLOBE supplies 18 retail outlets in Bujumbura, Mwaro, Rumonge and Ngozi provinces, while RENGERUBUZIMA supplies 15 retail outlets in Ngozi, Muyinga and Bujumbura. The major customers for the bean composite flour are women (65%).

OUTPUT 3.1.1: Business models and bean platforms for linking bean farmers to markets promoted in flagship countries

TARGET 2015-2020 (a):

At least 1 adapted business model and bean platform linking bean farmers to markets has been established.

TARGET 2015-2020 (a):

Two functional platforms

Progress: In 2018, a meeting to initiate a platform for different stakeholders along the bean value chain in Burundi was held in Muyinga and Gitega. To strengthen communication among the network members and enhance their capacity on quality seed production, a bean business platform was created to link various stakeholders. Similarly, a WhatsAapp group facilitated interaction and consultations between stakeholders regarding availability of seed and access to grain markets, extension and climate information. The WhatsApp group comprises 114 members, consisting of bean seed producers, extension services, traders, farmer organizations and NGOs (See Figure 29).

FIG. 29: Burundi WhatsApp bean group

OUTPUT 3.1.2: Commercial and nutritious bean-based products promoted through value chains in flagship countries

TARGET 2015-2020 (a):

At least 1 value chain per country for processed products and value chains for nutrient dense bean products established

Progress: Between 2015 and 2020, the special flagship project for Burundi established two value chains along bean seed and grains, and bean composite flour. The project started with one bean processor and currently, a total of six small and medium enterprises are processing bean composite flour in Bujumbura, Kayanza, Ngozi and Kirundo provinces. There is a high demand at local markets due to the positive feedback and experiences shared by the community crèche. The project started with less than 20 seed entrepreneurs, and the bean program in Burundi is now working with more than 100 located in different regions of the country.

TARGET 2015-2020 (B):

Two promotion strategies per country for processed products

Progress: Most bean consumers in Burundi combined cooked beans with foods such as banana, potato, rice and vegetables. Awareness and promotion about various ways of preparing beans (see Fig. 30). During the current reporting period, Development partners including World Vision Burundi, Inades formation and Confédération des Associations des Producteurs Agricoles pour le Développement (CAPAD) in partnership with ISABU nutritionist and technology transfer specialist provided nutrition sessions to groups in several locations to create awareness about bean based products. They also performed several events and held exhibitions and mass media radio and print media outreach to sensitize communities about the benefits of these products. As a result, more than 100,000 households have been reached with information about these products (see Fig. 30). Since 2017, World Vision Burundi has incorporated bean porridge into their feeding programmes for children under five and breastfeeding mothers.

FIG. 30: Bean based products developed and promoted in Burundi from 2015-2020

TARGET 2015-2020 (c):

Business model used to support trade of processed bean products per country

Progress: During the current implementation phase of the project, processors used their own business models to sell bean-based products. They focused on awareness creation at community level. TOTAHARA is working with the youth to advertise bean products. The firm recruited youth to move from house to house as they advertise bean flour produced by the factory. They travelled across different parts of Bujumbura, creating awareness about the benefits of consuming bean porridge, offering cooking demonstrations and product tastings. This increased the number of customers for the bean-based flour.

IMMEDIATE OUTCOME 4.1: Increased access to skills, information and knowledge providing enabling environment for bean research and development

TARGET 2015-2020 (a):

50,000 people accessing information (through trainings, printed materials, demos, and mass media)

Progress: From 2015-2020, the project exceeded the target with a contribution of 149% (See Table 12). In partnership with various development partners, ISABU developed and disseminated several information materials, communication and knowledge tools on various aspects of bean value chain. Mass media was also used to reach a wider audience within a short time.

TABLE 12: Number of people exposed to new skills, knowledge, and information through mass exposure

PEOPLE EXPOSED TO NEW SKILLS, KNOWLEDGE AND INFORMATION									
YEAR	2015	2016	2017	2018	2019	2020	TOTAL	TARGET 2015-2020	% CONTRIBUTION TO TARGET
Total	3,081	4,214	15,200	15,974	21,493	25,793	85,755	57,500	149
%W	1,602	2,191	7,904	8,306	11,176	13,412	44,593	29,900	77

TARGET 2015-2020 (b):

Levels of satisfaction with information media are at 75% through trainings, printed materials, demonstrations, and mass media outreach.

Progress: Constant feedback from participants showed that there is a slight increase in levels of satisfaction, from 50% in 2015 to 56% in 2016 and 2017. This rose to 65% in 2018; 75% in 2019 and 75% in 2020. This has surpassed the project target of 70%.

OUTPUT 4.1.1: Women's participation in research and decision-making bodies of PABRA and in bean platforms increased

TARGET 2015-2020 (a):

40% increase in women's participation in research and decision-making bodies of PABRA, and in bean platforms

Progress: Women were not leaders of associations or cooperatives for a long time in Burundi, due to socio-cultural reasons. Currently, good progress has been made as a result of gender mainstreaming training. Capacity building activities to promote gender mainstreaming at community meetings, regional PABRA meetings and business platform meetings, has improved the participation of women, with the percentage of women in leadership positions in producer organizations increasing 45% across eleven provinces by 2020. The participation of women in leadership positions has influenced women's access to quality seed of improved varieties, technologies and market information.

OUTPUT 4.2: Educate men, women and youth on gender equity

TARGET 2015-2020 (A):

50 people will be trained for year 2020

Progress: Due to the COVID-19 pandemic and the imposed restrictions on gatherings, this activity was not done in 2020. It has been postponed to 2021.

OUTPUT 4.1.3: Skills and knowledge of bean value chain actors (NARS scientists, private sector, farmers, traders, processors and consumers) enhanced

TARGET 2015-2020:

57,500 men and women participants benefiting from various capacity building initiatives (52% female)

Progress: Between 2015-2020, a total 51,645 (24,790 men and 26,855 women), above 50% female (Table 13), participated in various capacity building initiatives (degree and non-degree training). The activity was carried out in collaboration with several NGOs, government projects and producer organizations. Trainees were then able to train other members of their cooperatives and associations and their neighbors, allowing the project to exceed the targeted number of beneficiaries reached.

TABLE 13: Men and women participants in capacity building initiatives in Burundi (2015-2020):

CATEGORY	2015	2016	2017	2018	2019	2020	TARGET 2015-2020	TOTAL	ACHIEVED	% WOMEN
National Agricultural Research System/ Partners/Professional programs	55	95	119	125	215	14	1,500	2,123	142	40
Farmers (Farmer Field Schools, field days, demonstrations, agricultural shows etc.)	2,350	3,500	12,320	12,650	17,468	18,445	38,500	102,938	267	70
Traders (Platforms/ Farmer engagements.)	85	105	155	160	201	100	1,000	1,776	178	52
Extension Workers/ Services	60	86	136	152	188	175	2,000	2,792	140	40
Others (Don't belong to above category)- Students	531	468	2,534	2,957	3,581	7,018	14,500	31,113	215	45
Total	**3,081**	**4,214**	**15,264**	**16,044**	**21,653**	**25,752**	**57,500**	**140,742**	**942**	**247**

TABLE 14: Product profiles for Bush and climbing beans in Burundi

PRODUCT PROFILE	CATEGORY	PRODUCTION TRAITS				TARGET	PRIORITI-ZATION
		BIOTIC STRESS	CROP YIELD	ABIOTIC STRESS	CONSUMER TRAITS		
Large red kidney	Bush	Disease resistance and Pest resistance (BSM, ALS, BCMV, and Bruchids.	More than 20% over commercial checks (KATX56, RW2091, RWR1092).	Drought resistance.	Cooking time. Palatability, High Iron and Zinc. Seed color retention.	Domestic (75%) and Regional market (25%).	4
	Climbers	Disease resistance and Pest resistance (BSM, ALS and Bruchids).	More than 20% over commercial checks (Kinure, IZO201543, G13607).	Low soil fertility.		Production Hub: Low to high altitude (1000-3000 masl) and rainfall (min 500 mm per year).	
Sugar bean	Bush	Disease resistance (CBB, Haloblight, BCMV, Anthracnose, ALS).	> 20% over commercial checks (CODMLB003, Musengo, RWR2154).	Drought tolerance	Canning quality Cooking time High Fe and Zn Seed color retention	Domestic (75%) and Regional (25%) market	1
	Climbers	Pest resistance (BSM and Bruchids)	> 20% over commercial checks (AND10, MUHORO)	Low input soils		Production hub: Low to high altitude (1000-3000 masl) + rainfall (min 500mm/yr)	

PRODUCT PROFILE	CATEGORY	PRODUCTION TRAITS				TARGET	PRIORITI-ZATION
		BIOTIC STRESS	CROP YIELD	ABIOTIC STRESS	CONSUMER TRAITS		
Yellow beans	Bush	Disease resistance (CBB, Haloblight, BCMV, Anthracnose, ALS).	More than 20% over commercial checks (KATB1, BCB-11-404, MOORE80082).	Drought tolerance.	Canning quality. Cooking time. High Iron and Zinc. Seed color retention.	Domestic (50%) and Regional market (50%).	3
	Climbers Rwanda	Pest resistance (BSM and Bruchids).	More than 20% over commercial checks (Jaune volubile, Gisetsagabore and Rusenyanzego	Low input soils.			
Red mottled	Bush	Disease resistance (CBB, Halo-blight, BCMV, Anthracnose, ALS).	> 20% over commercial checks (GLP2, KTX69, RWR2245).	Drought tolerance	Canning quality Cooking time. High Iron and Zinc. Seed color retention.	Domestic (70%) and Regional (30%) market.	2
	Climbers	Pest resistance (BSM and Bruchids).	More than 20% over commercial (MAC44, MAC70).	Low input soils			

ZIMBABWE PROGRESS ON ACHIEVEMENT 2015 -2020

Executive summary

Under the flagship initiative launched in 2015, five areas of emphasis were identified for intervention in Zimbabwe: i) Increase access to high yielding dry bean cultivars and productive ICM technologies; ii) increase access to micronutrient rich bean products among the vulnerable groups; iii) increase access to profitable local and national markets; iv) increase access to skills, information and knowledge providing enabling environment for bean research and development; v) capacity building of bean value-chain actors. The planned objectives have been achieved as outlined below:

- Food consumption increased by 16.1 points among families depending on rain-fed farming, which is equivalent to gaining four animal-based high nutrient meals over a period of five years. In terms of food security, the number of households with poor food consumption reduced by 8.7% from a baseline of 12% in 2016.
- At farm level, utilization of resilient improved varieties increased from 9% of the households in 2015 to 47% in 2020, while the adoption of bio fortified high Iron (Fe) and Zinc (Zn) content, NU45 variety, increased from less than 2% in 2016 to 12% in 2018 impact assessment results. The number of client-oriented bean varieties released increased from four to ten. Among the additional six varieties were: i) Two biofortified varieties (NUA674 and Jasmine) with higher Iron (Fe) and Zinc (Zn) content for improved nutrition; (ii) Three varieties (Protea, Jasmine and Gloxinia) for the baked bean canning industry, and (iii) One drought tolerant variety (Sweet William).
- Engagement of seed houses to multiply and market certified seed, resulted in increased volumes of bean seed in the market, from 520 tons in 2015 to 6,781 tons in 2020, surpassing the target of 3,000 tons.
- Four ICM technologies (Rhizobium inoculant, Trichoderma bio-pesticides, Vermi-compost and adjusting planting dates) were evaluated for their economic performance under risk of climate change. The use of Trichoderma bio-pesticides proved beneficial in enhancing resilience to climatic risks.
- Private and public sector partners were engaged to promote seed of improved bean cultivars and complimentary ICM technologies, reaching around 1,331,000 households over the six years of the project – way beyond the target of 750,000 households.
- Four bean-based products - against a target of three - were developed through private sector engagement: i) Bean flour; ii) Biofortified bean grain; iii) Canned biofortified beans and iv) Orange maize-bean *samp*.
- Two nutrition sensitive approaches, through restaurants and retail outlets, that support the bean-based products were validated and promoted.
- The number of households accessing biofortified bean varieties increased significantly from 8,000 in 2015 to 185,000 in 2020. Similarly, those accessing bean-based products increased from 3,000 in 2015 to 103,000 in 2020, surpassing the initial target of 100,000 households.
- The production and consumption hubs of highly demanded and marketed bean varieties are known and mapped, which fit into two major bean agro-ecological zones (North- Eastern and South-Western) in the Zimbabwe bean corridors.
- Several approaches were developed and implemented for enhancing linkages among bean value-chain actors, for example: i) one business model linking bean farmers to markets; ii) two business models used to support trade in processed products, and iii) five functional innovation platforms were established.
- Gender equality has been enhanced with regard to employment in bean-value chains. The percentage of women employed in seed companies and aggregator businesses has grown from 10% in 2014 to 38% in 2020.
- In 2019-2020, small businesses such as retailers and agro-dealers employed a higher proportion of women (56%) compared to men (44%).
- Gender responsive business platforms have resulted in women and youth accessing extension services, seed and skills in value addition. As a result, the yield among women farmers doubled from 850 kilograms per hectare in 2019 to 1600 kilograms per hectare in 2020. Youth farmers jumped from 500 kilograms per hectare to 1,400 kilograms per hectare during the same period. Some of the women and youth have gained business skills and now add value to beans and sell at 50% higher prices than that of grain.

Project achievements to date (2015-2020) Zimbabwe

The Ministry of Lands, Agriculture & Rural Resettlement through the Department of Research and Specialist Services (DR&SS) in Zimbabwe in partnership with the Alliance through the bean programme Pan Africa Bean Research Alliance (PABRA) work in partnership to strengthen the linkages among bean value-chain actors, among them traders and processors, to boost local bean production, supplying consumers and the local bean canning industries. The interventions have focused on building and transforming the bean sub-sector to demonstrate their significant impact on the livelihood of millions of households in Zimbabwe.

The following are the foci of the research and development work in these two countries:

i. Extend the climbing bean technologies in various agro-ecologies of Burundi;
ii. Strengthen the bean cropping systems to cultivate different bean varieties as part of integrated crop management systems including conservation agriculture, to raise productivity at farm level and bridge yield gaps;
iii. Develop the seed production and delivery systems: engaging both the public and private sector partners and using various seed delivery options for wide dissemination;
iv. Support nutrition initiatives linked to bio-fortified bean varieties and nutrition information;
v. Increase women's access to agricultural resources for improved bean production, and knowledge of basic nutrition;
vi. Support capacity building of researchers, development partners, value-chain actors and farmers to enhance relevant skills for improved bean production.

INTERMEDIATE OUTCOME 1: Increased bean productivity

TARGET 2015-2020 (a):

1100 kg/hectare bean yield in Zimbabwe

Progress: In 2020, the average national bean yields under rain-fed conditions and under irrigation were 440 and 1,100 kilograms per hectare respectively. This is because the 2020 crop season was characterized by late onset of rains across the country and this affected the crop establishment. Long dry spells in late December 2019 and January 2020 negatively affected the crop yield. However, the five-year average depicts a general steady increase in bean production over the years (Figure 31).

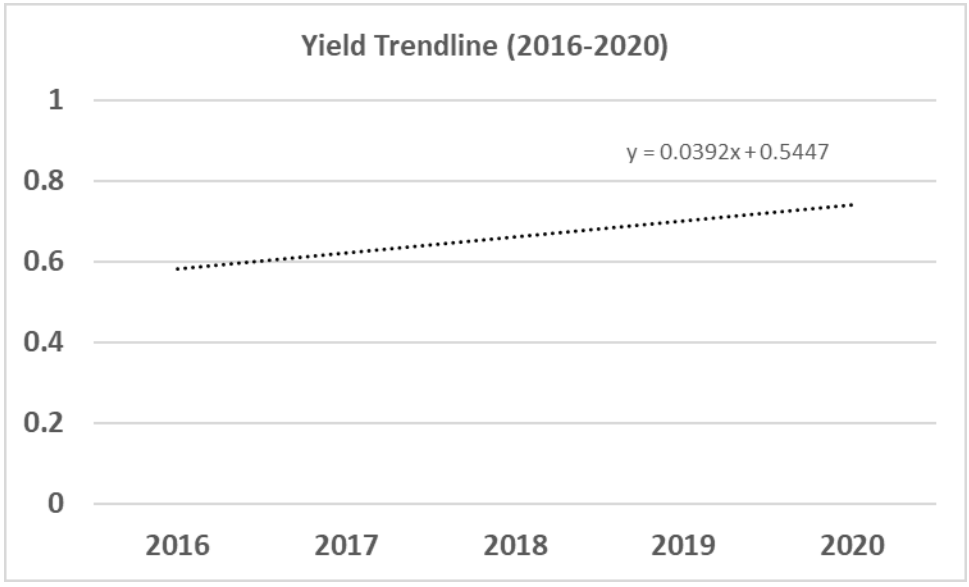


FIG. 31: Increase in bean production over the years in Zimbabwe.

TARGET 2015-2020 (b):

33% increase in area occupied by bush bean combined with CSA in Zimbabwe

Progress: Estimated production has increased by 33% from 18,530 metric tons in the 2018/19 season to 24,650 metric tons in the 2019/2020 season. The increase is attributed to a marked improvement in productivity levels of 42% from 0.3 tons per hectare to 0.44 tons per hectare national bean average in the 2019/20 season.

IMMEDIATE OUTCOME 1.1: Increased and gender equitable access to high yielding dry bean varieties and productive ICM technologies and information

TARGET 2015-2020 (a):

750,000 households accessing seed of improved dry bean varieties, ICM and labour-saving technologies; **60%** representing women beneficiaries

Progress: Since the inception of the project, there has been increase in access to seed of improved bean varieties, Integrated Crop Management (ICM) and labor-saving technologies for both male and female farmers in Zimbabwe. The number of households accessing seed of improved dry bean varieties were 4,600,085 (2,726,451 female-headed, and 1,873,634 male-headed) (Table 15).

TABLE 15: Number of households accessing quality seed of improved varieties in Zimbabwe (2015-2020)

YEAR	HOUSEHOLDS ACCESSING SEED		CUMULATIVE TOTAL	INCREASE
	FEMALE REPRESENTED	MALE REPRESENTED		
2015	210,000	140,000	350,000	0
2016	288,000	192,000	480,000	130,000
2017	386,160	257,440	643,600	163,600
2018	411,000	274,000	685,000	41,400
2019	666,291	444,194	1,110,485	425,485
2020	765,000	566,000	1,331,000	220,515
Target 2015-2020				750,000
% Completion				613

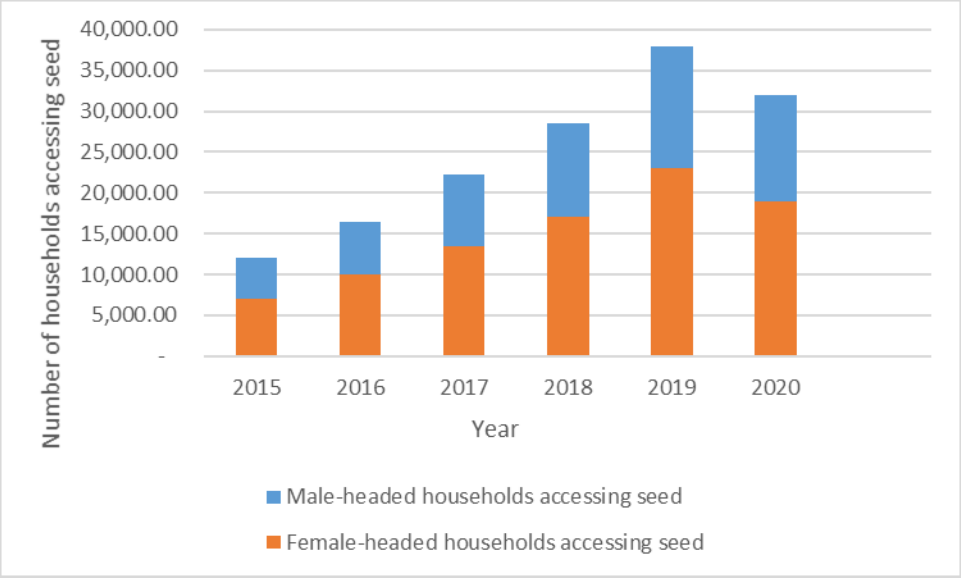


FIG. 32: Graph showing number of households accessing quality seed of improved varieties in Zimbabwe (2015-2020)

Out of the 1,331,000 households who accessed improved seed in 2020, 765,000 (57%) were female (Figure 32). The target for 2015-2020 has been surpassed six-fold, due to the increase in number of seed companies multiplying and marketing certified bean seed. The slower increase in 2019/20 compared to the previous year was due to COVID-19 lockdown restrictions, farmers' movement to buy certified seed was limited and they had to rely on nearby retail stores or agro-dealer shops that had stocked up seed before the lockdowns.

TABLE 16: Bean Seed Producers' Profiles

NO.	NAME OF SEED PRODUCER	PRODUCER CATEGORY	VARIETY NAME	VARIETY MARKET CLASS
1.	African Granary	Private seed company	NUA45	Calima(Large red mottled)
2.	Mkushi		NUA45	Calima (Large red mottled)
3.	National Tested Seed		NUA45	Calima(Large red mottled)
			Protea	Small white
4.	Zimbabwe Super Seed		NUA45	Calima(Large red mottled)
			Gloria	Sugar (Medium)
5.	Sandbrite seeds		Gloria	Sugar(Medium)
			NUA 45	Calima(Large red mottled)
6.	Zadzamatura		Gloria	Sugar(Medium)
			NUA 45	Calima(Large red mottled)
7.	IQ farmer		Gloria	Sugar(Medium)
8.	ARDA	Public (Quasi government/Parastatal)	NUA45	Calima(Large red mottled)
			Protea	Small white
			Sweet Violet	Sugar(Large)
			Sweet William	Sugar(Large)
			Gloria	Sugar(Medium)
			Cherry	Calima(small red mottled)
9.	Supreme Seeds	Private	Sweet violet	Sugar(Large)
			Gloria	Sugar (Medium)
			Cherry	Calima (Small red mottled)
10.	Champions Seeds	Private	Sweet Violet	Sugar(Large)
11.	Easi Seeds	Private	NUA45	Calima(Large red mottled)
			NUA674	Sugar(Large)
12.	Imbeu	Private	Gloria	Sugar (Medium)
13.	SIRDC	Public (Quasi government/Parastatal)	Gloria	Sugar (Medium)
14.	Seed Co	Private	NUA 674	Sugar(Large)

TABLE 17: Target 2015- 2020 (b): 32 000 women and youth accessing labour saving technologies

YEAR	NUMBER ACCESSING LABOUR SAVING TECHNOLOGIES		CUMULATIVE TOTAL
	FEMALE	YOUTH	
2015	7,000	5,000	12,000
2016	10,000	6,500	28,500
2017	13,500	8,700	50,700
2018	17,000	11,500	79,200
2019	23,000	15,000	117,200
2020	19,000	13,000	149,200

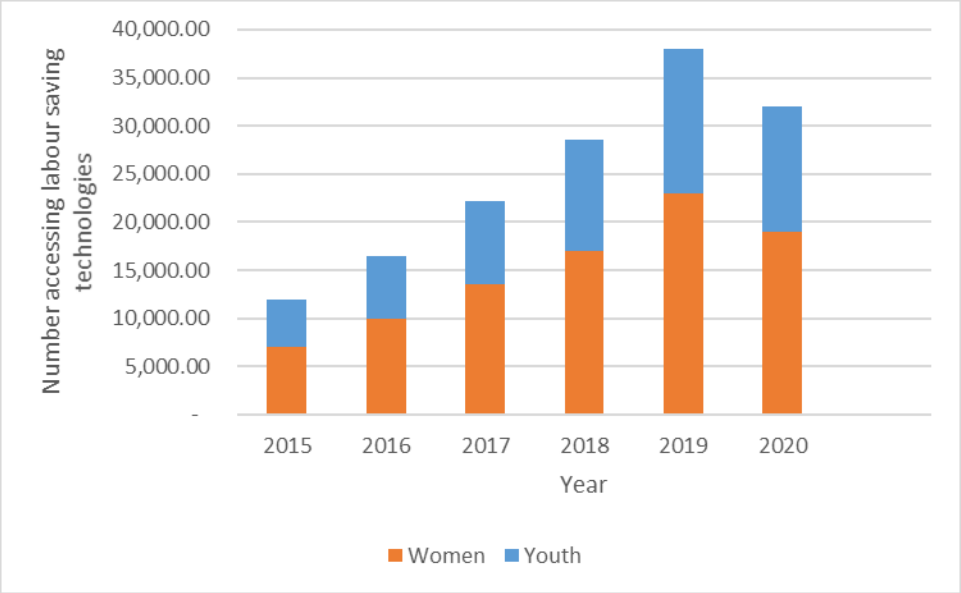


FIG. 33: Graph showing number of women and youth accessing labour saving technologies.

Progress: Despite their hard work in agriculture, women's access to productive resources such as land for bean production is still limited. Land ownership influences the quantity produced by women and youth because of full control over their plots making timely decisions. However, the involvement of women and youth in bean production has grown, as a result of capacity building trainings and participation of women and youth on beans and venturing into bean contract farming. Two labor saving technologies identified and promoted were use of herbicides and use of short season varieties which include Gloxinia and Sweet William which matures in 75-80 days. In 2020, around 89,500 women and 59,700 youth had access to labor saving technologies (Table 3 & Fig.33). Use of herbicides have proven to ease operations like weeding and some farmers are now opting to control weeds using chemicals.

TARGET 2015-2020 (c):

Not specified, the climbing bean material is still under evaluation on both on farm and on station

Progress: Climbing beans were evaluated across five on-station sites and 15 on farm locations. Under farmers' management, 30 farmers were given HIB climbing beans for trial. 700 households had access to the introduced climbing bean genotypes both on station and on farm locations. In 2019, first evaluations indicated that genotypes like MAC119 and VCB81013 were high-yielding. Second evaluations of the 15 genotypes will be repeated in the 2021/22 season both on farm and on station sites.

TARGET 2015- 2020 (d):

65% satisfaction with the delivery systems for dry bean varieties products and ICM for food security

Progress: Farmer satisfaction with ICM technologies was assessed in 2020 through participatory technology selection in 15 sites within the North Eastern and South Western Bean Corridors. From the 450 farmers who participated, 75% were of the opinion that the demonstration plots should be large enough so as to cover an area of about one acre. About 65% of Farmers satisfied with ICM technologies. This figure was arrived at from a sample of farmers who were involved in Participatory Technology Evaluations in sites were the ICM technologies were demonstrated. The sample consisted of 205 male farmers and 182 female farmers giving a total of 387 farmers. The 252 farmers make 65% of farmers who participated in the ICM technology evaluations, who were satisfied with the technologies in relation to input cost reduction. As for yield performance, 279 farmers out of the 387 were happy with the yield increase in relation to pest and disease. For drought and which was scored using the response of bean varieties to Trichoderma 221 making 57% of the farmers happy with this attribute.

OUTPUT 1.1.1: Competitive high-yielding and stress-tolerant varieties developed across various agro-ecologies and cropping systems

TARGET 2015-2020:

Six (6) high yielding stress tolerant bean varieties released across the two flagship countries.

Progress: In 2020, there was no variety release but in line with demand led breeding, some progress in the development of another canning bean variety is in progress. Three potential candidates namely G40, G97, G40 will be sent for DUS and at the same time canners will conduct the canning quality tests and any candidate line which meets canning standards will then be released. Agreements were set in place to enable the bean value-chain actors in the canning industry to start moving together. During the six-year period (2015-2020), Zimbabwe registered four stress-tolerant bean varieties: Sweet William in 2016, Protea in 2018, Gloxinia (AFR703) in 2019 and Jasmine in 2019. Sweet William, a sugar bean type, is in high demand locally, for the domestic dry bean industry in Zimbabwe. It was released because of its drought tolerance, high grain yield potential and tolerance to diseases of economic importance. Farmers located in dry areas who could not grow beans before are now venturing into bean production, increasing national production volumes (Figure 34).

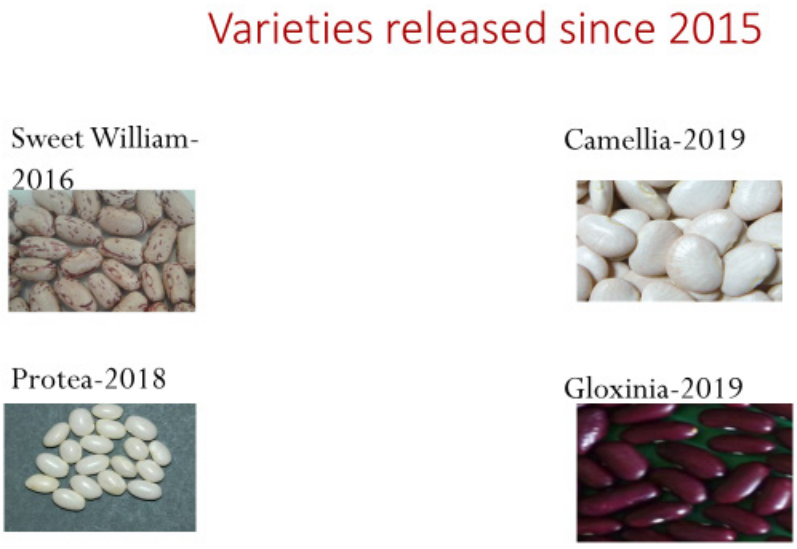


FIG. 34: Bean varieties released since the start of the project

Despite the lockdown restrictions in the country, 15 Participatory Variety Selection (PVS) trials were conducted at Nyamhemba, Tikwiri, Gudyanga, Tonhorai, Musikavanhu, Mutema, Nyahoni, Insiza, Gweru, Chigodora, Nyamaropa, Nyanyadzi, Deure, Maunganidze, Chibuwe and Nyahoni in 2020. The activity was done after the crop was harvested so farmers were selecting genotypes basing on seed size, seed color, seed yield and marketability (Figure 5.)
Women farmers preferred small seeded genotypes because they cover a large area when used as planting material (retained seed) compared to large seeded genotypes. On the other hand, male farmers preferred large seeded genotypes because when marketing, fewer grains are required to fill a 50-kilogram bag (high volume). Since harvesting of trials was done during lockdown period, scoring for traits like pod shattering, disease tolerance and earliness was not done.

The DR&SS Bean Programme has integrated gender the Demand Led Breeding (Demand - led Breeding through a Gender lens: Experiences from Zimbabwe - (pabra-africa.org). The bean team piloted the Gender customer and product profile tool in Zimbabwe. This activity was done with Excellence in Breeding (EIB) and the gender breeding initiatives with other CGIAR centres like International Potato Centre, International Centre for Agricultural Research in the Dry Areas and International Institute of Tropical Agriculture.

OUTPUT 1.1.2: Effective and economically viable ICM options for increased dry bean productivity and resilience identified and promoted

TARGET 2015-2020:

15 better economically and farmer accepted ICM including conservation agriculture technologies for increased dry bean productivity and resilience developed

Progress: Over the past six years, the project has adapted thirteen integrated crop management technologies for bean production in Zimbabwe. These include: i) legume-cereal intercrop; ii) inorganic fertilizer; iii) inorganic fertilizer/early maturity of cultivars; iv) compost/farmyard or animal manure; v) minimum/conservation tillage/mulching/liming; vi) ridges; vii) tied ridges; viii) sole cropping systems; ix) Bio-fertilizers Pu-LuTong; x) Bio-pesticides Trichoderma; xi) Cultural + chemical weed control; xii) Rhizobia inoculation and xiii) Energy M. Many of these technologies existed in Zimbabwe but they were used on other crops, so the project adapted them to common bean.

In 2020, new ICM technologies included use of i) Trichoderma, ii) Apron Star, iii) Well crop, iv) Pu Long Tong and (v) vermicompost. These technologies were evaluated on-farm in 15 irrigation schemes; –Ascot, Bumburwi, Zhulube, Insukamini Garden, Nyamhemba, Tikwiri, Nenhowe, Gudyanga, Chibuwe, St Weinberg, Nyahoni, Nyamaropa, Tonhorai, Musikavanhu and Mutema.

Results indicated that: i) Most of the farmers preferred rotation, ridges, use of tolerant varieties and mulching as cultural methods; ii) Diazinon was the most used insecticide in all the areas in controlling Bean Stem Maggot, while Copper Oxychloride and Dithane M45 were the most preferred fungicides in controlling various bean diseases; iii) Apron star was rated the most effective seed dressing by most farmers as it reduced soil borne fungi diseases and soil insect pests such as cutworm. However, the challenge was on its availability as this is only purchased from Zimbabwe Fertilizer Company and Syngenta. Farmers also requested if it is possible for seed houses to use Apron star as seed dressing so that they can purchase bean seed, which is already treated; iv) The best ICM technology was sowing seeds treated with Apron star, on ridges, with mulch on rotated fields. Chemicals were used when necessary as they are expensive and harmful to people and the environment. The farmers requested for more bean varieties that are tolerant to Bean Stem Maggot, Common Bacterial Blight and Common Bean Mosaic Virus. In all the irrigation schemes, the popularly grown varieties were Gloria and NUA 45 because these varieties are tolerant to some diseases and are high yielding; v) The farmers found out that the application of Vermicompost, either alone or in combination with mineral fertilizers, increased bean yield. It improved the soil physical conditions which supported better aeration to plant roots, drainage of water and sustained availability of nutrients. Use of Vermicompost constitutes an alternative source of fertilizer that is cheaper, has environmental benefits, and increases productivity and crop quality compared to inorganic fertilizers.

To facilitate improved access to the various ICM technologies that were promoted, the project established and strengthened linkages with private sector partners. The eight private sector partners involved in promoting ICM technologies include: i) Syngenta, ISFM control of weeds using herbicides and control of fungal diseases using Apron Star; ii) Four seed companies, Pannar Seeds, Agriseeds, Klein Karoo and Seed-Co were all engaged to promote bean varieties alongside control of weeds using different planting spacing; iii) Zimbabwe Earthworm farms, promoting agriculture using organic fertilizers (Vermicompost); iv) Earth Microbes, promoting organic fertilizers and v) China Foliar Fertilizer, promoting improved bean production using foliar fertilizers. These initiatives have encouraged private sector to invest in agro-input supply chains, supporting farmers with better access to agro-input services.

In 2020, the use of different types of top-dressing fertilizers rhizobia, ammonium nitrate and Nutrifol were identified in the North Eastern bean corridor. The fertilizers are used mostly by farmers in irrigation schemes. At Tikwiri Irrigation Scheme in Rusape, farmers are split applying 100 – 150 kilograms per hectare of ammonium nitrate at least three times due the fact that the soils here are sandy and nutrients are readily leached down the soil profile. This practice increased the dry bean yield with a single application from 675 to 1,564 kilograms per hectare with three times split application. The split application reduces leaching of nutrients which may find their way into rivers, polluting water sources. In Chipinge District, farmers are using foliar fertilizer (Nutrifol) which gives higher bean yields of up to 1,871

kgs. per hectare more than when ammonium nitrate is used, yielding 837 kilograms per hectare. The use of rhizobia inoculants was found to be effective. Four bean varieties NUA45, Gloria, Cherry and Sweet violet were evaluated for their response to Rhizobium inoculation and nitrogen fertilizer. The results obtained showed that there were significant (P<0.5) differences between the varieties with respect to grain yield in response to rhizobia inoculation. The greatest response to inoculation was from Cherry with a yield of 911 kilograms per hectare for inoculated beans compared with 523 kilograms per hectare without inoculation. The was little response to inoculation for the other varieties.

Expanding Climate Information for Beans (CIS4B) to Zimbabwe

To enhance farmers' and value chain resilience including climate adaptation and mitigation, CIS4B successfully rolled out. PABRA used Digital AgroClimate Advisory (DACA) application (see Fig. 35) – a collection of digital climate maps and other mobile tools to deliver location specific weather, climate and bean advisory services (Putting digital agro-climatic services in the hands of bean value chain actors - (pabra-africa.org). DACA used to spread information from the Trainers of Trainees to other stakeholders along the beans value chain. 16 DACA Experts (four per districts) were trained and eight DACA learning hubs created (two per districts). A series of trainings were conducted at the Ngondoma Irrigation Scheme, Insukamini One Irrigation Scheme, Insukamini Two Irrigation Scheme, Shungudzevhu and Rupike Irrigation Scheme Sites where 100 people (65 women, 29 men and 5 female youth) participated. The trainees are expected to train their peers in villages.

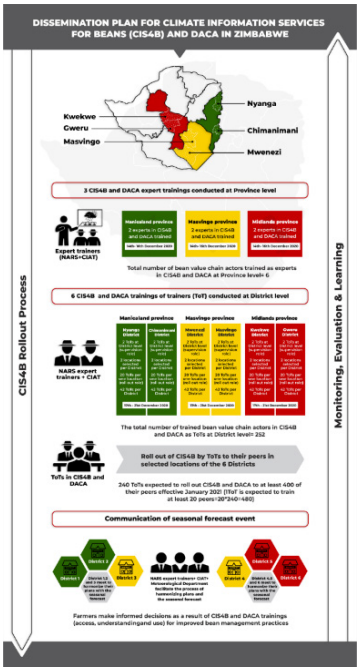


FIG. 35: The DACA application interface

OUTPUT 1.1.3: Gender specific labour-saving technologies validated

TARGET 2015-2019 2020 (a):

Two gender specific labour efficient saving techniques/ technologies identified and then in use

Progress: Two labour saving technologies identified and promoted

TARGET 2015-2020(B):

80% levels of satisfaction with the technologies

Progress: In 2020, weed management using cultural, chemical and mechanical control methods were promoted in the bean corridors. The use of herbicides reduced labor cost of bean production compared to mechanical weeding. Gender specific labor-saving technologies promoted included herbicides, short duration varieties and mechanized

equipment. In terms of the use of herbicide, labour days needed for manual hand weeding was reduced from 24 days to four days. In using hermitic storage bags the need for cleaning the grain was reduced by three labour days from six labour days for every ton of stored grain. The variety gloxinia, reduces labour for pest control and weeding per hectare from 18 days to five days. The levels of satisfaction with herbicide use were monitored, and from 58 farmers who responded to survey questions, 81% were satisfied with the cost of herbicides, perceived as low or fair, while 86% were satisfied that herbicides reduced labor requirements in bean production.

OUTPUT 1.1.4: Gender responsive delivery systems for seed of preferred dry bean varieties

TARGET 2015–2020 (a):

3,000 tons of seed for new bean varieties produced and disseminated

Progress: Since the start of the project, there has been a significant improvement in certified seed production and dissemination. In six years, the target of 3,000 tons has been surpassed, as actual production is at 6,781 tons, valued at US$ 40,686,000. Over the years, Zimbabwe was known for its formal and organized seed system, especially for staple commodities such as maize and wheat but not for legumes and small grains. The legume value-chain was characterized by low formal and highly informal seed development and marketing arrangement. The production and dissemination of certified seed and other technologies has been enhanced through mutually increased beneficial public-private sector partnerships (see Table 18) catalyzed by the project.

TABLE 18: Bean Seed Producers' Profiles

NO.	NAME OF SEED PRODUCER	PRODUCER CATEGORY	VARIETY NAME	VARIETY MARKET CLASS
1.	African Granary	Private seed company	NUA45	Calima(Large red mottled)
2.	Mkushi		NUA45	Calima (Large red mottled)
3.	National Tested Seed		NUA45	Calima(Large red mottled)
			Protea	Small white
4.	Zimbabwe Super Seed		NUA45	Calima(Large red mottled)
			Gloria	Sugar (Medium)
5.	Sandbrite seeds		Gloria	Sugar(Medium)
			NUA 45	Calima(Large red mottled)
6.	Zadzamatura		Gloria	Sugar(Medium)
			NUA 45	Calima(Large red mottled)
7.	IQ farmer		Gloria	Sugar(Medium)
8.	ARDA	Public (Quasi government/Parastatal)	NUA45	Calima(Large red mottled)
			Protea	Small white
			Sweet Violet	Sugar(Large)
			Sweet William	Sugar(Large)
			Gloria	Sugar(Medium)
			Cherry	Calima(small red mottled)
9.	Supreme Seeds	Private	Sweet violet	Sugar(Large)
			Gloria	Sugar (Medium)
			Cherry	Calima (Small red mottled)
10.	Champions Seeds	Private	Sweet Violet	Sugar(Large)
11.	Easi Seeds	Private	NUA45	Calima(Large red mottled)
			NUA674	Sugar(Large)
12.	Imbeu	Private	Gloria	Sugar (Medium)
13.	SIRDC	Public (Quasi government/Parastatal)	Gloria	Sugar (Medium)
14.	Seed Co	Private	NUA 674	Sugar(Large)

Increased emphasis on nutrition-sensitive agricultural value chains by the Government of Zimbabwe has also increased production of certified bean seed, with subsequent interest by seed companies to multiply and market bean seed, alongside other bean production inputs. This reinforced dissemination of inputs through community-based organizations, NGOs, supermarkets and agro-dealers.

The following companies were supported by the project to produce foundation and certified seed: Green Trade Seeds, Mkushi Seeds, Agri Seeds, IQ Farmer, African Granaries, Klein Karoo (K2), ARDA Seeds, National Tested Seeds, Zimbabwe Super Seeds, Champion Seeds, and Zadzamatura/Tocek. In 2020, Easi seeds and Supreme seeds were contracted to multiply and market certified seed, bringing to a total of 14 the number of seed companies marketing and multiplying DR&SS bean seed varieties.

INTERMEDIATE OUTCOME 2: Increased utilization of improved bean-based products for nutrition security.

TARGET 2015-20 (a):

100,000 households utilizing biofortified bean varieties across the flagship country

Progress: HIBs have been included in the government "Pvumvudza" small holder government input policy support as a result of policy advocacy by AGRITEX – private sector company. In 2020 about 175,500 households accessed HIB bean seed varieties, and over the years the total is 909,169. Inclusion of HIBs in government programmes led to the increased access to biofortified bean varieties. Commercialization of best bet bean products in various retail outlets has resulted in increased access to bean-based products, where 96,000 households, had accessed bean-based products in 2020, and over the years the total was 322,500 households, which is well above the target of 100,000 households by 222%. During the impact assessment survey conducted in 2020, it was noted that in some districts in rural areas, farmers has limited access to bean-based products. There is need to conduct more trainings on bean value addition.

TARGET 2015-20 (a):

100,000 men, women and children consuming bean-based processed products across the flagship country

Progress: In 2020, around 2,300 extension workers drawn from various districts received information on production and value addition of beans into various products through trainings and flyers so that they take the information to farmers from their respective areas. Training on nutrition (Figure 36) with a gender lens facilitated consumption at household level because both men and women participated. A total of 480,000 consumers were recorded, men, women and youth recorded were 100,000, 280,000 and 100,000 respectively.

FIG. 36: One of the outdoor practical activities during trainings

IMMEDIATE OUTCOME 2.1: Increased access to micronutrient rich bean products among the vulnerable groups in a gender equitable manner

TARGET 2015-20 (a):

750,000 households accessing combinations of HIB bean varieties and ICM technologies across the flagship countries. **57%** women targeted (of the 750,000).

Progress: High market access to biofortified varieties has grown since 2015 rising over the years from 8,000 households accessing varieties to 386,256 households in 2019. However, there was a decline in 2020 due to COVID-19 as farmers had limited movements to access seed and bean-based products. A large proportion of households accessed biofortified bean varieties (60%) compared to other bean-based products (40%). This is because most nutrition programs by the government and development partners are using NUA45 - a biofortified bean variety - in their interventions. As a result, more seed producers have registered to multiply and market the NUA45 bean variety. The number of households accessing bean-based products increased from 3,000 in 2015 to 255,000 in 2019, however a decline is observed in 2020 due to COVID-19 lockdown movement restrictions. The mandatory food fortification policy has resulted in increased demand for biofortified crops such as beans and pro Vitamin A maize, and processors such as Cairns Foods Limited and Healthy Foods have commercialized the NUA45 bio fortified bean. The nutrition interventions have focused on the following: i) Use of the food basket approach to develop products suitable for consumption by children under five, processing beans into flour and mixing with other nutritious food such as baobab powder rich in vitamin C; ii) Promotion of diverse diets at community level, introducing diverse ways of preparing and consuming beans, and: iii) Presenting bean-based products at exhibitions, forums such as trade fairs, agricultural shows and special events to raise awareness.

Since 2015, nutrition education and promotion activities were concentrated in the north eastern and south eastern corridors. At community level, the project continues to promote the production and consumption of released, HIBs, at trade fairs, field days, agricultural shows and food fairs. Seventeen Primary schools, five youth and 11 women groups were part of the nutrition education and awareness campaigns done in collaboration with the Ministry of Health and Child Care, Crop and Livestock Production Department, LEAD Trust Feed the Future project, Cluster Agriculture Development Services and Healthy Food.

In 2020, trainings and awareness creation campaigns on biofortified bean cultivars, biofortified bean-based products, value addition and nutritional and health benefits of biofortified products were conducted at 15 irrigation schemes. A training was also carried out for Agriculture Extension officers in Gwanda so that they can train their farming communities on nutrition. The training involved 20 (8 female, 12male) extension officers drawn from five wards of Gwanda. Ten primary and secondary schools in the eastern highlands Nyanga and Mutasa districts (7,000 students) also received trainings. Agricultural colleges (5,000 candidates are receiving information on importance of using HIB through their new curriculum. The trainings involved cooking demonstrations (maize-bean *samp*, fritters, bean cake, porridge, yoghurt, *mahewu*, bread, biscuits), demonstrations on biofortified bean-based products, field days. Due to COVID-19, there were no joint physical meetings and activities with our key stakeholders.

OUTPUT 2.1.1: Micronutrient rich bean varieties with superior agronomic traits developed

TARGET 2015-2020 (a):

Two biofortified bean varieties released in the flagship countries

Progress: In 2020, no new HIB varieties were released in Zimbabwe, as the target indicator was achieved when NUA 674 and Jasmine were released in 2018 and 2019 respectively. In 2015 the government of Zimbabwe launched the National Food Fortification Policy. Since then, the project has been promoting the production and consumption of biofortified bean-based products, hence complementing government efforts. NUA674, a biofortified variety, was released to compliment NUA 45.

As such, the focus during this reporting period was on campaigns to promote HIB bean varieties in partnership with

other projects (Harvest Plus and Technologies for African Agricultural Transformation (TAAT) - HIB Compact). The campaigns were in form of field days, trainings and demonstrations across 15 locations.

FIG. 37: Biofortified beans released since 2016

TARGET 2015-2020 (b):

3,000 tons of seed of new bio fortified varieties produced and disseminated by partners

Progress: Through a network of seed companies, 4,825 tons of certified seed of the biofortified bean variety (NUA45) was produced and supplied between 2015-2020 (Table 19). This represents 60% above the target set (3,000 tons) for the period 2015-2020, and 733,669 households accessed the seed over the six-year period.

TABLE 19: Volumes of certified seed of biofortified bean varieties produced since 2015-2020

YEAR	QUANTITY (MT)
2015	24
2016	96
2017	363
2018	420
2019	640
2020	3,285
Total	4,825
Target 2015-2020	3,000
% completion	160

OUTPUT 2.1.2: Bean based products and tools adapted, developed and promoted

TARGETS: 2015-2020 (a):

Three best-bet products developed across the flagship countries

Progress: In 2020, the following bean-based products were developed and promoted:

a. Bean based composite flour; i) Bean and pearl millet flour; ii) Bean, sorghum and pearl millet flour; iii) Bean and finger millet flour.

b. *Samp* mixtures; i) Bean and maize *samp* mixture; ii) Bean and sorghum *samp* mixture; iii) Precooked beans, precooked maize and beans mixture; iv) Precooked beans, maize and groundnuts mixture.

c. Bean stews and bakes. The products were developed in various ways to suit different consumers, i.e., rural consumers in the marginal areas where crops like finger millet, sorghum and pearl millet are commonly grown, and urban consumers.

Bean flours including composite products such as porridge, *samp* and other mixes were promoted among

communities, in partnership with various NGOs and Livelihoods and Food Security Programme (LFSP), International Fund for Agriculture Development (IFAD) and other stand-alone programmes through trainings and food fairs. The following organizations are still promoting bean-based products, Healthy Foods, mesostream PVT LTD, Utsanzi and CADS.

TARGETS: 2015-2020 (b):

Two tools - recipe book and nutrition handbook - developed through community nutrition engagement in the flagship countries

Progress: Different nutrition-related tools have been developed by different actors: The Ministry of Health developed and distributed posters and flyers, Ministry of Primary and Secondary schools Education developed healthy harvest training materials, nutrition education in schools, IFAD/SIRP project distributed 300 healthy harvest materials for small holder farmers nutrition awareness and trainings, LFSP (FAO project) distributed several posters, materials and flyers through their implementing partners to over 20,000 farmers and the Alliance of the International Center for Tropical Agriculture and Bioversity International Harvest plus translated HIB materials into Shona and Ndebele for distribution to various provinces.

OUTPUT 2.1.3: Nutrition sensitive approaches that support the utilization of bean-based products validated and promoted

TARGET 2015-2020:

Two approaches validated and promoted (the food basket approach and school feeding approach)

Progress: In 2020, nutrition-sensitive approaches were promoted, including: restaurants, retail outlets, home grown school feeding. The promotions were done in collaboration with various other projects: EXTRA, Livelihoods and Food Security Program, Ministry of Health and Child Welfare, Cluster Agriculture Development Services and Ministry of Primary Education.

The project promoted the food basket approach, involving the preparation of beans in various ways to diversify diets and increase nutrient density of bean-based dishes. The food basket approach develops products suitable for children under five. The school feeding approach is useful to educate schoolchildren and neighboring communities about the nutritive value of high iron beans and the various ways of preparing bean-based products.

OUTPUT 2.1.4: Influencing in-country nutrition strategies and facilitating availability of micronutrient-rich bean products

TARGET 2015-2020:

One policy brief

Progress: HIBs has been included in the government “Pvumvudza” small holder government input support as a result of policy advocacy by DR&SS and AGRITEX. An estimated 300,000 farmers have accessed bean seed through the program and about 100,000 of these got HIBs. Collaboration with harvest plus has incorporated Orange Maize and biofortified bean to be included in specific government data collection exercises especially crop and livestock assessment, which will make it possible to access statistics on the use of these products

INTERMEDIATE OUTCOME 3: Increased trade of bean products

TARGET 2015-2020 (a):

40% increase in volumes of improved dry bean varieties traded

Progress: In 2015, the volume of bean trade was at 7,351 tons, stagnant up to 2017. The volume rose to 10,400 tons in 2018, up by 40% over the previous year, and subsequently by 44% (2019) and 47% (2020) (Table 5). Overall, the

increase in annual bean trade volume jumped from 7351 (2015) to 22,000 (2020), about 200% increase over the six years of the project. This is an indication of considerable progress, in making more bean available at the markets after adoption of the corridor approach. At farm-level, data from 2018 study, indicated that the average quantities of bean traded by producers increased from 288 kg in 2016 to 358 kilograms per household in 2018 - an equivalent of 43%. The project had a target to reach 30,000 tons of bean trade over the project period from 2015 to 2020, this was surpassed by over 100%, reaching 69519 tons over the six-year period (Table 20).

TABLE 20: Volumes of beans traded form 2015-2020 in Zimbabwe

	2015	2016	2017	2018	2019	2020	TOTAL	TARGET 2015-2020
Volume (MT)	7,351	7,350	7,418	10,400	15,000	22,000	69,519	30,000
% change	-	0%	1%	40%	44.2%	46.6%		

IMMEDIATE OUTCOME 3.1: Increased access to profitable local and national markets in a gender equitable manner

TARGET 2015- 2020 (a):

250,000 households selling to profitable markets across the flagship country

Progress: The number of households selling beans to profitable markets has risen steadily from 2016 reaching 2,210,000 households over a six-year period (Table 21), eight times above the target. This could be attributed to the innovation platform approach where farmers were linked to ICT platforms so as to access technical and market information. Farmers were also linked to processors; they could produce grain and sell to the canners. In addition, farmers got into contract farming with various seed companies who are marketing bean varieties developed by DR&SS.

TABLE 21: Number of households selling to profitable markets and consumers accessing processed products

INDICATOR	2015	2016	2017	2018	2019	2020	TOTAL	TARGET 2016-2020	% CONTRIBUTION TO TARGET
Number of households selling to profitable markets	-	250,000	320,000	500,000	540,000	600,000	2,210,000	250,000	884%
Number of consumers accessing processed products	3,000	10,000	25,000	45,000	91,000	100,000	274,000	200,000	137%

TARGET 2015- 2020 (b):

200,000 consumer households accessing processed products

The number of consumers accessing processed products has been rising steadily from 3,000 in 2015; 10,000 in 2016; 25,000 in 2017; 45,000 in 2018; 91,000 in 2019 and 100,000 in 2020, making a total of 274,000 over the six-year period. This surpasses the target of 200,000 set for the flagship countries by 137%, and mainly due to high demand for beans in Zimbabwe - more than 96,000 tons annually. This quantity continues to grow because of increased government emphasis on nutrition-sensitive agricultural value chains. Currently, Zimbabwe is a net importer of beans, importing more than half its national demand from neighboring countries such as Zambia, Malawi, Mozambique and South Africa. To build its bean production capacity, Zimbabwe has used both the commodity corridor and innovation platforms to boost bean production and marketable volumes and reduced bean imports.

OUTPUT 3.1.1: Business models and bean platforms linking bean farmers to markets promoted in flagship countries

TARGET 2015-2020 (a):

At least one business model and bean platform for linking bean farmers to markets promoted

TARGET 2015-2020 (b):

One functional platform for linking bean farmers to markets established

Progress: Two business models were promoted in Zimbabwe: i) Buyer-led model and; ii) Producer led model. In 2020, an increase in number of seed companies marketing DR&SS-bred bean varieties has led to an increase in these firms contacting producers as the main buyer. In addition, five functional business platforms are operational in Gudyanga, Nyanyadzi, Shungudzevhu, Manunure and Nyamaropa.

OUTPUT 3.1.2: Commercial and nutritious bean-based products promoted through value chains in flagship countries

TARGET 2015-2020 (a):

One value-chain per country for processed products and value-chains for nutrient dense bean products established

Progress: In 2020, an impact assessment survey was conducted during the period 04 October to 14 October 2020. The survey was conducted in eight districts with data collected through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). The study found that bean flour from high iron beans has been commercialized by women groups in Chimanimani, who even donate bean-based porridge to a nearby clinic. In 2019, the women groups also showcased bean products and sold NUA 45 grain at Harare Food festival

IMMEDIATE OUTCOME 4.1: Increased access to skills, information and knowledge, providing enabling environment for bean research and development

TARGET 2015-2020 (a):

300,000 people accessing information (through trainings, printed materials, demos, and mass media)

TABLE 22: Number of people accessing information through trainings, printed materials, demonstrations, and mass media in Zimbabwe (2015-2020)

	2015	2016	2017	2018	2019	2020	TOTAL	TARGET	% CONTRIBUTION TO TARGET
People accessing to skills, information and knowledge	1,497	1,604	2, 004,696	462,098	46,672	40,000	2,668,071	300,000	789

Progress: During the six-years, 2,668,071 farmers, extension workers, traders and seed producers in Zimbabwe enhanced their skills through seed fairs, agricultural shows, demonstrations, trainings, workshops, meetings, field days, trade fairs and food fairs. There was an upward growth of the number of people with improved capacity: from 1,497 in 2015; to 1,604 in 2016; 2,004,696 in 2017; 462,098 in 2018; 46,672 in 2019 and 40,000 in 2020. In 2018, the number went up because of value addition trainings, where 17 primary schools, five youth groups and 11 women groups participated. These trainings ensured that key stakeholders along the bean value-chain accessed basic knowledge about value addition and nutrition. The bean programme also worked with various partners to develop and disseminate 26,927 information materials such as variety catalogues, leaflets, and manuals on improved crop management, brochures and farming as a business. In 2019, the numbers went further up and these are attributed to the interest of bean value-chain actors and development partners supported by the availability of resource manuals

such as flyers (25,000), calendars (5,000), recipe books (6,000) and training plus demonstrations where 10,672 participated: 4,923 males and 5,749 females. However, in 2020 a slight decrease in number of people being trained was observed due to COVID-19 restrictions measures. Collaborations with Ministry of Health, Ministry of Primary and Secondary schools, IFAD, CIAT Harvest plus enable the dissemination of following material: 20,000 posters and flyers, 500 healthy harvest materials, trainings and demonstrations were 1,626 participated (726M, 900F). Trainings in nutrition were also conducted in the hot and drier parts of Zimbabwe (Matebeland and Masvingo provinces).

FIG. 38: Pamphlets and flyers distributed to farmers at a farmer demonstration farm

OUTPUT 4.1.1: Women's participation in research and decision-making bodies of PABRA and within bean platforms increased

TARGET 2015-2020:

43% of women involved in research and decision-making bodies of PABRA, and in bean platforms increased

Progress: Inclusion of women in decision making bodies has improved in 2020. Women now hold high decision-making positions like Treasurer, Vice Chair and are involved as committee members. Out of seven members in the decision-making bodies, three are women which amounts to 43%.

OUTPUT 4.2: Educate men, women and youth on gender equity

Progress: In 2016, a total of 60 (39 male and 21 femal farmers were trained in the North Eastern corridor (Gudyanga and Nyanyadzi). In 2017, focus group discussions were held in three innovation platforms namely Shungudzevhu, Nyamaropa and Manunure, and a total of 79 (35 male and 44 female) farmers were trained. A total of seven gender groups and sub groups were identified in a population that comprised 52.7% men and 47.3% women. These included males, females, youths (boys and girls), widows, widowers, disabled and single parents. At least 7,896 people were accessing information through trainings, printed materials, demos and mass media. In 2018, individual interviews were conducted, where ten focus groups comprising of five males and five females each (100 participants) were involved. In 2020, a total of 667 (324 male and 343 female) farmers were trained at 15 irrigation schemes.

OUTPUT 4.3: Skills and knowledge of bean value-chain actors (NARS scientists/ private sector/farmers traders, processors and consumers) enhanced

TARGET 2015-2020 (a):

200 men and women participating in various capacity building initiatives in degree and non-degree

Progress: In 2020, through trainings and meetings approximately 12,810 farmers, extension workers, traders, seed producers and school children had their skills enhanced. The number of people trained steadily increased from 4,370 in 2015 to 12,810 in 2020.

TABLE 23: XXX

CATEGORY	2017	2018	2019	2020
National Agricultural Research System/ Partners/Professional programs	26	18	14	7
Farmers (farmer field schools, field days, demo, agric. shows etc.)	1,005	1,005	1,193	663
Traders (Platform/Farmer engagements etc.)	155	150	89	90
Extension Workers/Services	40	40	30	50
Others (*Don't belong to above category*)- Students	1,000	1,000	1,000	12,000
Total	**4,370**	**1,313**	**2,326**	**12,810**
Target 2016-2020				20,000
% contribution to target				104

OUTPUT 4.4: NARS capacity for gender disaggregated monitoring and evaluation systems strengthened

TARGET 2015-2020 (a):

12 NARS contact persons identified and trained on Monitoring and Evaluation

Progress: In 2018, A total of 12 participants were trained by outcome leaders and technicians on gender mainstreaming in beans, the training was carried out at Harare Research Centre. In 2019, two officers were trained on Gender Researchers Equipped for Agriculture Transformation (GREAT) and 10 extension officers were trained on ICT. In 2020, a virtual three-day training workshop was organized from 17-19 November with the aim of training expert trainers in Climate Information Services for Beans (CIS4B) and (Digital AgroClimate Advisory) DACA. Participants were from DR&SS and the Meteorological services department of Zimbabwe and a total of seven experts were trained.

OUTPUT 4.1.5: Impact assessment of interventions conducted in flagship countries of Burundi and Zimbabwe and the results disseminated

TARGET 2015-2020:

Impact assessment studies conducted in two flagship countries, and reports or results disseminated

Progress: The impact assessment survey data was collected in Zimbabwe in 2018. Econometric methods were used to evaluate the effect of improved variety adoption on outcome indicators, notably: yield; bean consumption and marketed volumes. Results from this analysis have been highlighted in the summary of this report. The final report has been drafted and is undergoing internal editing by the country team.

In 2020, additional impact assessment study was carried out to understand how men, women and youth have participated and benefited from the Flagship project as a whole and also to determine number of jobs created in the bean value chain. The impact assessment survey was conducted during the period 04th October to 14th October 2020. The survey was conducted in eight districts (Kwekwe, Gweru, Mutare, Shurugwi, Chimanimani, Nyanga., Masvingo and Mwenezi).

Some key findings based on focus group discussions and Key Informant Interviews, indicated that:

a) Employment in the bean value chain

- Seed companies are contracting farmers for two to three years to grow foundation seed
- More women than men are hired to sort and grade beans because it requires care and concentration. However,

offloading and loading are mostly done by men, this is a general observation made during the interviews

- Each enterprise has a main depot with men and women personnel that carry out operations such as sourcing, processing and packaging is done and then distributed to the retail shops across the country
- Some farmers are self-employed, producing beans and selling to aggregators, middlemen and among themselves
- Women are mostly employed in processing industry and also community processing

b) Gender in the bean value chain

- More women than men are bean producers with men more involved in gold mining and other alternative businesses
- Youth involvement in bean production is still low because of limited access to and ownership of land and other resources
- Due to cultural barriers, women's decision making is still low as men still make most of the farm decisions
- Increased number of women in leadership positions in the bean business or innovation platforms.

Lessons learnt over the past six years

- Awareness on key nutrition issues is key and still needs to be done at all levels
- Value addition is key to enhance women economic empowerment
- Gender considerations should start from project design to reporting and the a continues gender training of the farmers and partners is important if we want to achieve an equitable, inclusive and sustainable food systems
- Availability of more bean produce drives consumption and nutrition security
- Policy position drives any kind of desired change
- More than 50% of labour is provided by women, there is a need to provide and scale out more labour-saving technologies that acknowledge use by women and youths

Going forward

Multi-sector inclusion is needed, and there is a need for collaboration among agricultural workers, researchers, extension officers, and among sectors including the health sector and education, and social welfare to ensure that we impact the lives of all stakeholders.

- Need to continue strong engagement with industry so that new products can quickly be taken aboard and adopted by end users at all levels
- Foster equitable participation of both gender groups in research trials and demonstrations
- Continue with public-private partnerships
- Develop gender-responsive product profiles that prioritises and meet the needs and interest of men and women in the bean-value chain

ALL PABRA COUNTRIES: HIGHLIGHTS ON ACHIEVEMENT

INTERMEDIATE OUTCOME 1: Increased utilization of dry bean products for food security

TARGET 2015-20 (a):

9.5 million households using dry bean technologies in 20 countries in ECABREN and SABRN.

TARGET 2015-20 (b):

80% level of satisfaction for men and women farmers using improved dry beans, products, labour saving technologies for food security in a gender equitable and sustainable manner.

Progress: Utilization of improved varieties and complementary technologies across PABRA countries has reached 10.73 million over six years from 2015 to 2020. Improved bean varieties currently grown are primarily valued for yield, maturity period and market demand. Some of the important market demanded attributes attached to these varieties are grain price, colour, ease of shelling, nutritional value and taste. In Ethiopia, farmers were 66%; 63% and 58% satisfied with varieties for higher yield, early maturity and nutritional value respectively.

IMMEDIATE OUTCOME 1.1: Increased and gender equitable access to high yielding dry bean varieties and productive ICM technologies/information

TARGET 2015-20 (a):

19 million households, 50% represented by women, accessing seed of improved dry bean varieties, Integrated Crop Management and labour-saving technologies

TARGET 2015-20 (b):

At least 80% levels of satisfaction amongst those who assessed the dry bean varieties and productive ICM technologies/information

ANNUAL TARGET 2020 (a):

2.5 million households accessing seed of improved dry bean varieties, ICM and labour saving technologies

Achievement: A total of 2,758,659 households, 58.5% represented by women, in 2020 accessed improved varieties, ICM and labour-saving technologies, representing a 13% achievement above the annual target of 2.5 million (Table 24). In addition, a total of new 23 (15 stress tolerant and 8 High Iron) bean varieties were released in 2020, and a total of 14,472 tons of seed from both old and recently released varieties were produced and disseminated to partners. Eleven ICM technologies that complement the improved bean varieties to increase bean productivity were disseminated using eight delivery systems. There were also six gender-sensitive labour saving technologies that were identified and promoted.

TABLE 24: Number of men and women-led households accessing improved bean varieties ICM and labour saving technologies in across countries in 2020

TECHNOLOGY CATEGORY	HOUSEHOLDS LED BY MEN AND WOMEN		
	FEMALE	MALE	TOTAL
Varieties	1,600,022	107,609	2,758,659
ICM and labour saving technologies	30618	37422	68,041
Total	**1,630,640**	**145,031**	**2,826,700**

TARGET 2015-20 (B):

At least 80% levels of satisfaction amongst those who assessed the dry bean varieties and productive ICM technologies/information

Amongst those who accessed dry bean seed in 2020, 82% (39% being women) were very satisfied with the varieties developed by PABRA members (See Table 25). For instance, in Kenya, several farmers expressed their satisfaction with varieties with specific traits e.g. drought tolerant, disease tolerant, higher Iron and Zinc content. The seed access channels were through seed fairs, demonstration plots, and agro-dealers, local Quality Declared Seed producers and local markets.

TABLE 25: Levels of satisfaction with varieties amongst farmers in some PABRA countries

COUNTRIES	LEVEL OF SATISFACTION (ON A SCALE OF 0-5)	
	MEN	FEMALE
Tanzania	4	4
Ethiopia	5	4
Burundi	5	4
Kenya	3.5	3.5
Rwanda	4	4

Progress on targets above: The project set out to reach and benefit 19 million households, 50% being women, with improved varieties and Integrated Crop Management technologies by 2020. However, the cumulative reach of the last six year was 21,519,772 (13.2 % higher than the target); 58.2% of them women. The annual number of beneficiaries for each year is shown in Table x.

TABLE 26: Number of households accessing seed of improved dry bean varieties, Integrated Crop Management technologies across all PABRA countries (2015-2020)

YEAR						TARGET 2015-2020	PROGRESS 2015-2020	% ACHIEVED	% WOMEN
2015	2016	2017	2018	2019	2020				
2,572,469	2,361,166	5,039,067	5,474,364	3,246,006	2,826,700	19,000,000	21,519,772	113.2 %	58.2%

OUTPUT 1.1.1: Competitive high yielding and stress-tolerant varieties developed across various agro- ecologies and cropping systems in 20 countries

TARGET 2015-20:

100 competitive high-yielding and stress-tolerant, dry bean varieties released

Progress on target: In this phase, the target was to release 100 competitive, high-yielding and stress-tolerant bean varieties by 2020. Building on bean breeding initiatives from the previous phase, and other complementary projects supported by governments and donor agencies, PABRA member countries have registered several climate resilient and farmers/consumer (market) preferred bean varieties (Table 27).

TABLE 27: Number of preferred high-yielding, stress-tolerant varieties developed (varieties)

YEAR						TARGET	PROGRESS	% ACHIEVED
2015	2016	2017	2018	2019	2020	2015-2020	2015-2020	
20	20	30	31	22	15	100	138	138%

The PABRA network has a cumulative release of 138 varieties over the six-year period resulting in an achievement of over 38% above the target (Table 4). It is important to note that Botswana released for the first time a new *tepary*

bean (*Phaseolus acutifolius*) variety that is more heat tolerant than common bean. The 15 high-yielding, stress-tolerant market demanded varieties released in 2020 included: three from north and west Tanzania, i.e., RCB 593 (small red) as TARIBEAN1, SCR 61 (small red) as TARIBEAN3, KAB06F2-8-36 as TARIBEAN5 (large red mottled); nine from DCR-East and West: RWR1668 (large red), Munyama (large red), NABE 4 (red mottled), SER80 (small red), Prelon (small white), Binja, Kipendwa, K132 (large red mottled) and CODMLV096; and three from Botswana: CAL96 (large red mottled), DAB541 (large red mottled) and GK012 (small white-tepary bean).

OUTPUT 1.1.2: Effective and economically viable Integrated Crop Management options for increased dry bean productivity and resilience identified and promoted

TARGET 2015-20:

15 better economically and farmer proven Integrated Crop Management technologies for increased dry bean productivity and resilience, including labour saving

Progress on target: In the year 2020, project partners across PABRA member countries promoted 11 ICM technologies and 3 labour-efficient technologies. Some of the flagship ICM technologies include: seed dressing, climbing bean staking options, use of organic and inorganic fertilizers, use of PICS bags for post-harvest loss management and mechanized threshing. The technologies were promoted in partnerships with research for development partners and private sector input dealers. The number of ICM and labour saving technologies promoted varied over the years as indicated in (Table 28).

TABLE 28: Integrated Crop Management and labour saving technologies promoted by partners across PABRA countries (2015- 2020)

	YEAR						TARGET	PROGRESS	% ACHIEVED
	2015	2016	2017	2018	2019	2020	2015-2020	2015-20	
ICM technologies	9	13	10	21	7	11	15	21	140
Labor-efficient techniques/ technologies		1	2	14	5	3	5	14	280

NB: *Some of the technologies were similar across the countries and years, so these are annual counts, and not cumulative.*

The other countries promoted the use of biofertilizers, biopesticides, foliar fertilizers, weed management technologies using herbicides, conservation agriculture techniques, and water harvesting working with private sector and development partners.

Countries promoted innovative cropping systems such as proper spacing and intercropping that also served as system diversification strategies and climate-smart technologies. Proven climate-smart packages, such as innovative spacing and intercropping systems, drip and furrow irrigation combing with mulch to keep the moisture (see Fig. 39), and minimal tillage, were disseminated to smallholder farmers through demonstrations. In Southern Tanzania, various bean maize configurations were promoted as a form of systems diversification to guarantee a farmer of at least one crop should the season be unfavourable. It also optimised use of water and nutrients. Six demonstration plots were established at Litundu village (3 hamlets) and Mayale village (3 hamlets). Three patterns of simultaneous maize and bean intercropping systems were established on the demonstration plots. T1 = Single row of beans between two rows of maize (*moja moja*). T2 = Two rows of beans alternating with single row of maize (*mbili moja*). T3 = Two rows of beans alternating with two rows of maize (*mbili mbili*). Based on direct observation, pairwise and matrix ranking, farmers selected Pattern T1: Single row of beans between two rows of maize (*moja moja*). At Litundu, high beans yields were obtained on T1, of 2.1 tons per hectare, and low yields at T3 of 1.4 tons per hectare. At Mayale, high yields of beans were obtained at T1 of 1.6 tons per hectare, and low yields at T3, of 0.9 tons per hectare. Farmers selected *moja moja* system as the most preferred intercropping system1.

FIG. 39: Bean under drip irrigation and regenerative agriculture -mulch at AVEPO Farm, Siaya, Kenya

The project continued to advance models for promoting agricultural mechanization for land preparation, planting and post-harvest handling, to achieve greater efficiency and profitability in the bean value chain. Crop Bioscience Solutions, an entrepreneur in Tanzania, received support from the PABRA project as he launched bundled mechanization technologies in Manyara region, Tanzania. The bundled model includes: seed, tractor mechanization services, good agronomic practices, aggregating farmers in commercial blocks and markets linkages (Figure 40). The initiative worked with 25 youth and women to access production blocks and link them to off-takers (aggregators) - Samara General supplies. Crop Bioscience offered mechanization services to bean farmers on about 150 hectares and targeted an increase to reach 800 farmers in Manyara region.

FIG. 40: Deploying bundled mechanization services in Manyara, Tanzania

The use of Multi-Crop Threshers (MCT) reported previously has gained popularity across Tanzania as well as neighbouring countries. Imara Tech Ltd is scaling out the technology to Kenya, Malawi, Uganda, Zambia, and Zimbabwe. The growing need to reduce labour and drudgery during bean threshing has seen partners in Burundi, Ethiopia and Rwanda promoting local creation of the bean threshers. This is creating new business opportunities for youth and women (seed Youth agri-entrepreneur transforming his community through job creation in Tanzania - case of Pastory Tarasisi - (pabra-africa.org).

Various approaches were used to deliver the ICM technologies to farmers. The lead farmer approach was extensively used in Malawi. The Village Based Agents (VBA) and Farmer Support Center (FSC), bundled approaches, were used in Kenya and Uganda. There was a growth in the use of the ICT based platforms, mainly WhatsApp, across most project countries, especially with the restricted movement occasioned by the COVID-19 pandemic. The virtual tools enabled continued interactions among stakeholders to sustain bean production and trade. (Figure 41).

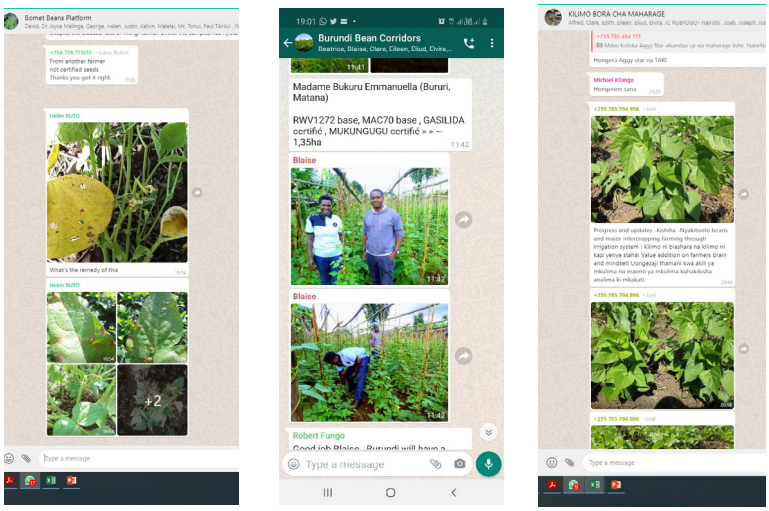


FIGURE 41: Use of WhatsApp groups to deliver ICM information.

Climate Information Services for Beans

The project successfully rolled out Climate Information Services for Beans (CIS4B) across target countries, with a special focus on Rwanda and Zimbabwe. The initiative built on the lessons learned from successful deployment to the Climate Information Services to build resilience of the bean value chain in Rwanda, where over one million farmers were reached. The project continued working with 120 farmers from 15 districts and demonstration plots, rotating beans with maize and using climate-smart agricultural management to prepare and anticipate changes in climate – such as dry spells in a cropping season – and the use other crop management inputs, such as early maturing bean varieties, mineral fertilizers, organic inputs, mulching and tied ridges. From October 2020, at least 12,032 farmers are using climate information to decide which bean varieties to plant based on length of the season and predicted total seasonal rainfall.

To roll out CIS4B across the rest of the PABRA countries, the project teams developed a Digital AgroClimate Advisory (DACA) application – a collection of digital climate maps and other mobile tools to deliver location specific weather, climate and bean advisory services (Putting digital agro-climatic services in the hands of bean value chain actors - (pabra-africa.org). All PABRA countries can access the above tools from Google Playstore under DACA. The project facilitated training for 72 Digital AgroClimate Advisory (DACA) experts across 10 PABRA countries in Burundi, Burkina Faso, Cameroon, Eswatini, Madagascar, Malawi, Rwanda, Tanzania, Zambia and Zimbabwe.
A similar approach will be used in rolling out CIS4B in other project countries in 2021.

OUTPUT 1.1.4: Gender responsive delivery systems for promoting seed of preferred dry bean varieties

TARGET 2015-2020 (a):

115,000 tons of seed of new bean varieties produced and disseminated

Progress on the targets above: As a result of heavy rains coupled with the COVID-19 pandemic and its related restrictions, seed production decreased in 2020 compared to 2019. PABRA member countries were able to produce a total of 14,472 tons of seed: 12,231.9 tons of certified seed and 2,240.3 tons of QDS seed. Cumulatively for six years, the project catalysed production of 124,192.2 tons of quality bean seed (107% achieved) - see Table 29.

TABLE 29: Certified and Quality Declared Seed (QDS) produced between 2015 and 2020

YEAR	PRODUCTION IN TONS	ESTIMATED VALUE IN US$	ANNUAL ESTIMATED AREA PLANTED IN HECTARES USING A SEEDRATE 60KG/HA)	% OF AREA COVERED BY NEW VARIETIES IN AFRICA
2015	20,252.6	30,378,900	337,543.3	4.39
2016	17,057.0	25,585,500	284,283.3	3.69
2017	24,759.7	37,139,550	421,661.6	5.48
2018	28,145.0	42,217,500	469,083.3	6.10
2019	19,505.9	29,258,850	325,098.4	4.23
2020	14,472	21,708,000	241,200	3.15
Total	**124192.2**	**186,288,300**		

The seed was produced through public and private partnerships catalysed by the National Agricultural Research System (NARS) bean programmes and Alliance of Bioversity International and International Centre for Tropical Agriculture across ECABREN and SABRN (See Table 30). Private sector accessed basic seed from NARS which were then multiplied into certified and QDS (See Table 31). Several public enterprises and private producers, small and medium enterprises and farmer groups, invested in the seed value chain which enhanced the sustainability and the scale of seed supplies. The diversified private-led seed production and supply targets various segments of farmers and their various seed demands, while widening the geographic, agro-ecological and socio-economic reach.

TABLE 30: Detailed quantity of certified and QDS produced in some PABRA member countries

NETWORK	COUNTRY	QUANTITY IN TONS
ECABREN	Burundi	1,345.1
	DRC	86.7
	Ethiopia	3,047.2
	Kenya	436
	Madagascar	7.85
	Tanzania	1,935.8
	Uganda	3,326.5
SABRN	Eswatini	54.8
	Lesotho	60
	Malawi	1,438
	Zambia	814
	Zimbabwe	1,920
Total		14,472

TABLE 31: Number of certified and QDS seed producers in some PABRA countries in 2020

COUNTRY	PUBLIC SEED ENTERPRISE	SMALL AND MEDIUM SEED COMPANIES	INDIVIDUAL SEED PRODUCER	FARM GROUPS	FARMERS ORGANIZATIONS
Burundi		4	51	24	7
DRC		2	30	21	5
Eswatini		2		10	
Ethiopia	5	2	1	1	4
Kenya	1	3			
Lesotho		2			
Madagascar			6		
Malawi		8		15	
Tanzania	3	8	90		

COUNTRY	PUBLIC SEED ENTERPRISE	SMALL AND MEDIUM SEED COMPANIES	INDIVIDUAL SEED PRODUCER	FARM GROUPS	FARMERS ORGANIZATIONS
Uganda		11		43	
Zambia		6	13	2	6
Zimbabwe		6			
Total	**9**	**50**	**191**	**116**	**22**

TARGET 2015 -2020 (b):

Six delivery systems for promoting seed of preferred bean varieties

Six market and non-market seed delivery systems were deployed. These include the use of affordable packs, demonstration support by seed packs, agro-dealers, seed aggregation in partnership with the off-takers and aggregators in the bean corridor, local grain markets, bundling seed with other inputs and services. The quality seed of improved varieties bundled with complementary technologies and services such as fertilizers, production information, and mechanization were provided to farmers to uptake improved varieties. A total of 3,675 tons of certified seed were bundled with fertilizers and seed information across all the countries while seed and mechanization were bundled in the two countries, Tanzania and Ethiopia. The seed bundling delivery system is increasingly growing and attracting more investments.

INTERMEDIATE OUTCOME 2: Increased utilization of improved bean-based products for nutrition security in a gender-equitable and sustainable manner

TARGET 2015-20 (a):

1.2 million households utilizing HIB varieties and Integrated Crop Management Technologies

The number of households utilizing HIB varieties has been rising over the years. By 2020, the cumulative number was 4,520,813, which is almost 377% of the target. In 2020, 2,244,886 households who used HIB, was more double the number in 2019 (1,016,722 households). The high utilisation of HIB in 2020, was attributed to their adoption in seven more countries. These include Democratic Republic of Congo, Zambia, Ethiopia, Rwanda, Eswatini, Mozambique and Madagascar. The high adoption of HIB can also be attributed to increased efforts on awareness raising, promotion to increase the uptake, growing interest by development partners and governments' support e.g. Tanzania, PABRA presents beans as an alternative to 'animal proteins' to encourage consumption at lunch or dinner in addition to breakfast, using a food basket approach in the bean corridors. This year, about 54% of women-led households used biofortified bean varieties especially during this time of COVID-19 (How beans can address food, nutrition and income challenges during COVID 19. - (pabra-africa.org). In 2020, in addition to flagship countries, other countries registered increase in the utilization of HIB (Table 32).

TABLE 32: Number of households utilizing HIB varieties over five years 2015-2020 across PABRA members

COUNTRY	YEAR				
	2015-2017	2018	2019	2020	2015-2020
Uganda	85097	541,786	213,346	315,943	1,156,172
Burundi	11,812	13,798	17,942	129,525	173,077
Zimbabwe	205,000	142,413	386,256	817,477	1,551,146
Malawi, Kenya, Rwanda, Tanzania,	120,300	139,000	399,177	934,828	1,087,477
Zambia, Ethiopia, Eswatini, Mozambique and Madagascar				552,941	552,941
Total	**422,209**	**836,998**	**1,016,721**	**2,750,714**	**5,026,641**
				Target	**1,200,000**
				% Achieved	**419%**
				% women	**54%**

TARGET 2015-20 (b):
1 million beneficiaries utilizing bean based processed products

TARGET 2015-20 (c):
80% satisfaction levels amongst men and women using new bean-based products

In Uganda, an untrained panel comprising of 432 people was used for consumer preference evaluation of bean based composite porridge developed and produced by Eastern Agricultural Development Company Ltd (*EADCL)* in Soroti. Each participant was given a hot porridge sample of about 50 millilitres in a 100 millilitre disposable cup and each participant was asked to taste and evaluate the porridge on a 5-point scale: 1-dislike very much, 2-dislike, 3-neither like nor dislike, 4-like, 5-like very much. The sensory attributes used were appearance, aroma, taste, and overall acceptability. About 97% of the women and men who tasted the porridge made from the composite bean flour porridges said they liked it and 3% neither liked nor disliked the porridge.

In Mozambique, results from a consumer appreciation survey indicate 92% of survey respondents including women, children, students, and elderly persons liked the bean composite porridge. The study also revealed 31 ways that consumers were using the bean base flour.

IMMEDIATE OUTCOME 2.1: Increased access to micronutrient rich bean products among the vulnerable groups in a gender equitable manner

TARGET 2015-20 (a):
2.4 million households accessing combinations of HIB varieties in 9 countries

Progress on the three targets above: Over a six-year period, a total of over 5.5 million households accessed biofortified varieties against the target of 2.4 million households, achieving 230% of the phase target (See Table 33). 52% of women-led households accessed HIB varieties. The awareness about the benefits of HIB has been communicated among the market players in several PABRA member countries and consumers including women and the youth, to facilitate competitiveness of biofortified beans in the market.

TABLE 33: Number of households accessing combinations of HIB varieties (2015-2020)

YEAR						TARGET	PROGRESS	%	%
2015	2016	2017	2018	2019	2020	2015-20	2015-2020	ACHIEVED	WOMEN
303,080	382,983	565,500	527,179	1,504,143	2,240,714	2,400,000,	5,527,771	230%	52

TARGET 2015-20B:
Two million male and female beneficiaries accessing bean-based food products

By 2020, the number of men and women benefitting from food bean-based products were 2.29 million, 65% of them women, indicating a 114% increase on the target (Table 34). The achievements are attributed to food bean based products that are tastier, nutritious and appealing to consumers who are more likely to prefer them due to this value addition. This implies that initiatives by PABRA and its partners, to disseminate improved value addition processing and preservation techniques have had an impact on various households. PABRA's principal target groups for value added products include children under five and women of childbearing age. This approach has involved establishing a self-sustaining value addition nutrition strategy across PABRA countries. Our target beneficiaries receive nutrition training with cooking demonstrations on how to incorporate the HIB into the household diets. "Lead mothers" in the community have been selected and supported to further share this information within the communities and foster the adoption of recommended feeding practices. Promotional activities, including community dramas, field days, and radio campaigns, have been conducted to increase the level of awareness of nutritional benefits of the biofortified beans, and thus increase demand and uptake by both government and non-governmental organizations (NGOs).

TABLES 34: Number of beneficiaries accessing food bean-based products (2015-2020)

YEAR						TARGET	PROGRESS	% ACHIEVED	% WOMEN
2015	2016	2017	2018	2019	2020	2015-2020	2015-20		
316,056	331,056	386,056	626,535	1,083,000	1,208,255	2,000,000	2,291,255	114%	65%

TARGET 2015-20 (c):

75% satisfaction levels amongst men and women with the delivery system of food bean based products in six countries, two in each network

The customer evaluation is going on and it will be reported in 2021

OUTPUT 2.1.1: Micronutrient rich bean varieties with superior agronomic traits developed

TARGET 2015-20 (a):

34 bio fortified bean varieties released

Progress on the targets above: In this phase, 45 improved bean varieties were registered across countries.

TABLE 35: High Iron Bean Varieties registered 2015-2020

YEAR						TARGET	PROGRESS	% ACHIEVED
2015	2016	2017	2018	2019	2020	2015-20	2015-20	
6	8	9	8	6	8	34	45	132%

Three biofortified varieties were released in Tanzania in 2020: SMC 18 (Bio fortified small white) as TARIBEAN2, COD MLB 033 (Red kidney bio fortified) as TARIBEAN4, and RWR2154 as TARI19 (sugar bean). Five were released in DRC East in 2020: HM21-7 (red mottled), RWR2154 (sugar), RWRV1129 (purple/kablanketi) and NUV 131-1 (large red), NUA45 (red mottled). This represents a surpassing of the target by 135%. PABRA is supporting each country to release at one farmer preferred and market demanded HIB variety.

OUTPUT 2.1.2: Micronutrient rich bean-based products and tools adapted, developed and promoted

TARGETS: 2015-20 (a):

Two tools - recipe book and nutrition handbooks - developed and promoted in five ECABREN and five SABRN countries; Three best bet products developed through private sector engagement

Progress on target above: The project set out to reach two million people consuming value-added bean products by 2020, especially women and children. Estimates based on data from output 2.1.2 indicate that the proportion of people consuming value-added bean based products in DR Congo, Kenya, Madagascar, Malawi, Mozambique Tanzania, Uganda, has increased by 198% in the last five years. In 2020 alone, 30 bean based products were developed by 31 partners across six bean corridors and accessed by 1,208,255 million people. These products included three bean based products (galettes, donuts, crunchies. Other products included bread, *chapati,* samosas, rock cakes, biscuits, buns, *bagia*, scones, bean porridge, a snack, souppurees and jam.

Due to COVID-19 pandemic restrictions, PABRA developed and shared 29 nutrition promotional materials that were complied with the respective national Standard Operating procedures for COVID-19, during the reporting period of 2020. These include developing and distributing materials via use of radio and televisions shows especially in Eastern and Southern Democratic Republic of Congo, Malawi and Uganda. Under the TAZAMA sugar bean corridor,

a book under TARI -Uyole Tanzania[1] was produced. Two posters and flyers were developed in Ethiopia by the Ministries of Health and Agriculture in partnership with the Ethiopia Institute of Agricultural Research and other development partners, Fifteen tools including were produced in DRC[2] while three tools including *M-Kilimo*, banners and a brochure were produced in Tanzania

OUTPUT 2.1.3: Nutrition sensitive approaches that support the utilization of bean-based products validated and promoted

TARGET 2015-20:

Two approaches validated and promoted (e.g. Food basket approach)

Progress: During 2020, three nutrition sensitive strategies have been deployed. These include school feeding programmes by Tanzania, women care groups in Mozambique and Malawi and integrating beans in the COVID-19 emergency programmes in Kenya. In Tanzania, schools were engaged through three agencies Africa Rising NAFAKA project (80 demos), ADP – Mbozi (21 demos) and Caritas were involved in integrating beans in their interventions in southern parts of Tanzania. In Mozambique and Malawi women care groups with 20 members each comprising pregnant women or lactating and with children under 5, were trained in nutrition education and better food preparation for better nutrition and health. In Kenya[3], HIB varieties were integrated in the emergency plan of establishing 1 million kitchen gardens to enhance household nutrition.

Through the national task forces on biofortification, school feeding and nutrition, nutrition and agriculture, and grain processors forum, PABRA engaged policy/decision makers and other various value chain actors in Tanzania, Malawi, Uganda, DR Congo, Zimbabwe, Madagascar, Mozambique, and Zambia. The engagement with the line ministries and the private sector partners helped develop and implement these strategies to include beans in their interventions. These strategies are being used to promote bean utilisation and consumption across several bean corridors in Africa.

OUTPUT 2.1.4: Influencing in-country nutrition strategies and facilitate availability of micronutrient bean products

TARGET 2015-20:

Three (3) policy briefs

Two policy briefs on integrating beans in the diets to improve nutrition, have been developed under EARAM for (Burundi) and under TAZAMA (Malawi) bean corridors. https://www.researchgate.net/publication/349836146_Biofortified_Beans_A_vehicle_for_improving_Nutrition_Income_and_Food_Security_in_Burundi.

INTERMEDIATE OUTCOME 3: Increased trade of bean products in a gender equitable and sustainable manner

TARGET 2015- 2019:

2.5 million tons

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1 In Tanzania, A book titled" Uzalishaji, usambazaji na matumizi sahihi ya maharage yenye madini chuma na zinki kwa wingi ili kuboresha afya ya mlaji".

2 East DR Congo, Brochures, banners, TV, radio shows, 500 calendars, leaflets, T-Shirts, caps, banners and Seed bags, were distributed to our partners in DRC East.

3 We had engagements with the Ministry of Agriculture, Livestock, Fisheries and Cooperatives to contribute to the National Action Plan to tackle Food Crisis accelerated by the impact of Covid-19 in the country.

Progress: 4,571,867 tons (183% of overall target). PABRA continued to use the Bean Commodity Corridor model[1] to support production, distribution and consumption of bean grains and processed products. Results from the countries show that bean production and trade continued on a positive trend (Table 36).

TABLE 36: Volume of bean traded across PABRA countries (2015-2020)

	PROGRESS								
	2015	2016	2017	2018	2019	2020	TOTAL	TARGET	% ACHIEVED
Traded bean (ton)	418,401	590,604	665,062	869,800	963,000	1,065,000	4,571,867	2,500,000	183%

There was a steady increase in bean volumes traded over the past six years (Figure x). Increased quantities were realized in Burundi, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zimbabwe and during the period. The modest increase in 2020 may have been due to the set in of the COVID-19 pandemic though full effects may be captured in 2021 due to lag effects of the trading.

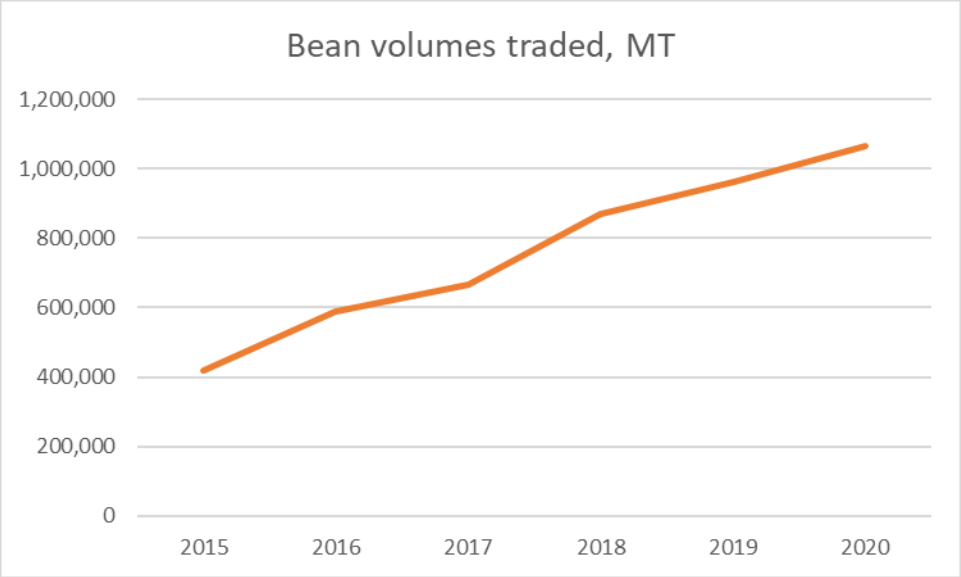

FIG. 42: Bean volumes traded in MT

Commodity corridors comprise of three hubs: production, distribution and consumption hubs. They refer to the flow of products from source to point of use and the hubs are the intensification areas designed to move products. PABRA define nine corridors across Africa (see Table X-14).

Under the bean corridor approach, PABRA continues to catalyze production, distribution and consumption of bean grain and bean based products. Four bean business platforms, each associated with a buyer, were established in Lesotho and Eswatini, two per country, increasing the number of platforms in the TAZAMA sugar bean corridor. In other corridors, the number of platforms remained stable since the previous year. However, the platforms continued to be strengthened during the period (Table 37).

TABLE 37: Bean corridors established in PABRA supported countries and their bean platforms

CORRIDOR	COUNTRY HUBS	DRIVING BEAN/ MARKET CLASS	NUMBER OF BEAN BUSINESS PLATFORMS
Sugar Bean Corridor (TAZAMA corridor)	Southern highlands of Tanzania, Northern Zambia and Northern Malawi, extended to Zimbabwe, Lesotho and Eswatini	Sugar Beans, small whites	16
East Africa Red Mottled (EAREM corridor)	Kenya, Uganda, Northern Tanzania and Rwanda	Red Mottled	18
Ethiopia Bean Corridors	Ethiopia	Whites and Reds	8
Yellow bean Corridor	Burundi and Western Tanzania	Yellow beans	2
Madagascar Bean Corridor	Madagascar	White bean	1

IMMEDIATE OUTCOME 3.1: Increased access to profitable local and national markets in a gender equitable manner

TARGET 2015-20 (a):
2.5 million households

TARGET 2015-20 (b):
1.5 million consumers accessing processed products

TARGET 2015-20 (c):
At least 80% levels of satisfaction amongst those who assessed the dry bean products in eight countries, 50% being women

Progress: Over five years (2015-2020), 4,039,074 farmers (51% women) were linked to more reliable markets for their beans across PABRA countries – with achievements of 161% compared to the target. The achievement in numbers linked to markets was observed in 12 countries in Eastern and Southern Africa (including flagship countries of Burundi and Zimbabwe). During the current year, the number of farmers linked to markets was about 30% lower than the previous year. This could be attributed to the effects of the COVID-19 pandemic that impacted bean production and trade due to border closures and limited to input such as seed, with some households opting to stock up on food instead of taking to market to sell due to uncertainties. Use of the corridor approach is enabling production and trade in more transparent manner across the countries, and has contributed to an increase of marketing activities compared to previous years (Table 38)[2].

TABLE 38: Access to profitable markets for smallholder bean producers

	2015	2016	2017	2018	2019	2020	TOTAL	TARGETS	% ACHIEVED
# of households selling to profitable markets	43,834	297,500	552,794	887,616	1,324,968	932,362	4,039,074	2,500,000	161%
# of consumers accessing processed products	15,271	217,000	432,000	76,854	98,344	405,643	1,245,112	1,500,000	83%

During the year 2020, the number of consumers accessing processed bean product rose to 405,000 (Figure 43). The cumulative numbers for the six years was 1,245,000, which was an achievement at 83% of the targeted numbers. The lower numbers reflect the lower marketing activities during the year for grain and the lower market participating households during the period due to the COVID-19 pandemic. The interest by private sector processors in bean based products continued during the period, for example, new bean processor in Malawi started the bean flour processing during the year. We anticipate more processors engaging in bean value addition in the next year.

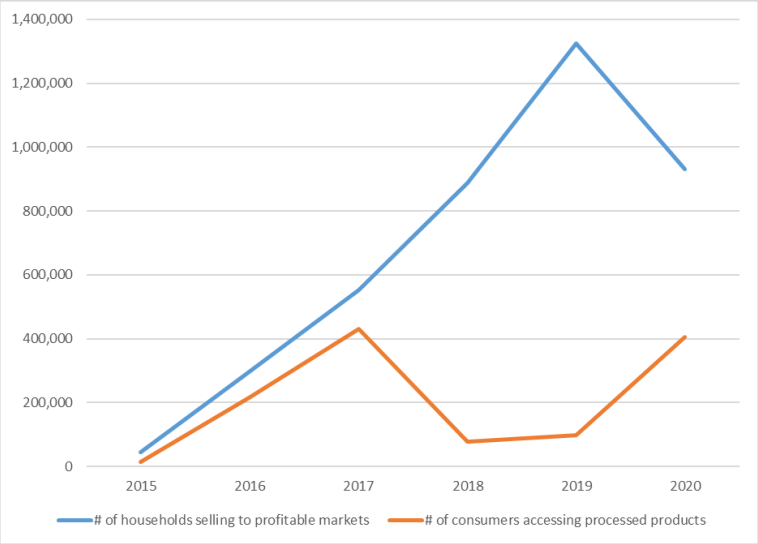

FIGURE 43: Number of households selling to profitable market and consumers accessing profitable markets and processed products

In 2019/20, PABRA in partnership with MasterCard and aggregators rolled out the MasterCard Farmer Network (MFN) digital solution. The MFN provides a service for farmers and aggregators to register in the digital produce collection and payment. Farmers receive real-time information through their mobile phones based on the submitted grain and eventually get paid through the mobile money system or bank account. The platform helped to track the commodity sale.

An assessment of satisfaction of men and women accessing markets in Tanzania and Uganda indicated that 94% of women 100 % men were satisfied with use of digital market application through the MasterCard Farmer Network (MFN). Bean producers and agents who had not tried the digital trading applications expressed interest to adopt the technology because of its perceived potential benefits such as timely payments and transparency.

OUTPUT 3.1.1: Business models and bean platforms for linking bean farmers to markets promoted in at least four of the target countries

TARGET 2015-20 (a):
At least one adapted business model per country established

TARGET 2015-20 (b):
One assessment of platform performance in selected countries

Progress: Most indicators associated with business models and linking producers to buyers have been exceeded and continued to be strengthened during the year. For example, business models, value chains and promotion strategies remained steady. The bean corridor model continued to be strengthened in order to structure bean production and trade, as well as increase interactions along bean value-chains among public and private investors. During the year, the number of bean platforms increased by four and reached 36, contributed by Eswatini and Lesotho with 2 platforms each (sugar bean and red mottled beans) and led by two buyers in each country. The bean platforms enabled members and buyers to find easier access the right type of bean grain - and in sufficient amounts. In many countries, opportunities to interact directly with buyers and producers is enhanced. (Table 39).

TABLE 39: Other achievements under markets

OUTPUTS	2015	2016	2017	2018	2019	2020	TARGETS	ACHIEVED
Number of business models linking bean farmers to markets	1	3	5	5	5	5	4	5
Number of functional platforms linked with off takers	2	8	16	28	32	36	5	36
Number of value chains of processed products analyzed	1	3	5	5	5	5	3	5
Number and types of promotion strategies for processed products	0	1	4	6	7	7	4	7
Number of business models used to support trade in processed bean products	0	1	4	4	4	4	3	4

Digital payment services continued to be deployed in Uganda and Tanzania via MasterCard Farmer Network (MFN), a collaboration between PABRA and MasterCard. The focus in both countries was to deepen usage of MFN by producers and SMEs. The efforts continued with Karagwe Development and Relief Services (KADERES) in Tanzania and in Uganda, with Community Enterprises Development Organization, (CEDO) and Eastern Agricultural Development Company Ltd (EADCL). Women participation as agents of the services and incomes for women producers was a major push for the strengthen efforts. From the 270,000 registered producers in both countries, usage rose as demonstrated by transactions conducted through the MFN platform. During the period, value of transactions increased to about US$ 5 million from US$ 1 million in the previous year for both beans and coffee in Tanzania. The number of transactions also increased two-fold to more than 5,000. Where women's participation is restricted by lack of ownership of land, the women are being supported to establish production groups in order to increase their participation in in bean trade. Women were enrolled as MFN agents to increase their benefit from the platform by earning commission fees). PABRA will continue deepening usage of MFN in order to double uptake and plans to scale to more countries such as Rwanda from next year.

OUTPUT 3.1.2: Commercial and nutrient dense bean-based products promoted through value chains in seven target countries (three of the countries targeting nutrition and gender sensitive value chains)

TARGET 2015-19 (a):

At least one value-chain per country for processed bean products and in three of the countries, value-chains for bio fortified bean products established

TARGET 2015-19 (b):

One promotion strategy per country for processed products in at least four countries

TARGET 2015-19 (c):

One model per country in the target countries

Progress: The number of countries with established value chains for processed nutrient-dense products had increased to nine in 2018 and were maintained in 2019 and 2020 (Table 40).

TABLE 40: Achievements in value-added products (cumulative)

DESCRIPTION	2015	2016	2017	2018	2019	2020	TOTAL	TARGET	% ACHIEVED
Number of countries with processed bean products	1	2	8	9	9	10	10	7	128%
Number of countries with a promotion strategy	1	2	5	9	9	9	9	7	128%

The number of countries with processed bean products increased by one in 2020. Malawi began processing bean flour bringing the cumulative number to 10 over the six years. A combination of consumer demand and new investment opportunities for the private sector continued to drive increase in demand for processed bean products thus deepening the reach of bean-based products in the countries. Nine countries (128% above target) continued with promotion strategies in 2020, this being a cumulative number over the six years. Some of the promotion strategies that continued to be employed include promoting the products through business to business (B2B) for supermarkets, business to consumer - to direct users - use of special or promotion events such as trade fairs, agricultural shows and exhibitions. In some cases, mass media, such as radio, television are used while text messaging and social media are also being evaluated potential use. Social media (e.g. Facebook, Twitter, WhatsApp) were being increasingly used to promote and market these bean based products, for example in FarmFresh beans from Rwanda, in Kenya by Smart Logistics and Cherubet, and in Zambia by Mushili Corporation.

IMMEDIATE OUTCOME 4.1: Increased access to skills, information and knowledge providing enabling environment for bean research and development

TARGET 2015 - 2020 (a):

6 million beneficiaries of which Trainings – 90,000, websites – 50,000 hits, printed materials – 50,000, demos – 10,000, Electronic media (radio, TV) – 5,000,000

Progress: From 2015 - 2020, the number of people accessing information through various channels was 42,458,436. A greater proportion accessed information through radio and TV. In 2020 alone, the proportion of those accessing information through TV and radio was 94%, while 5% was through virtual and on-site training and 1% via printed communication materials. Whatsapp, web pages, blogs and twitter were also a commonly used to communicate to targetted groups of viewers. In Tanzania four radio programs; Farm radio, Safina radio, Habari maalum and Sunrise radio had regular airings on bean production and good agronomic practices; in Zimbabwe Radio messages were aired on HIB, drought tolerant varieties, Good Agriculture Practice (GAPs) and in DRC, weekly radio talks on bean production were also aired. Whereas the public are the major target audience of TV and radio messages, for virtual and on site trainings, the target groups are National Agricultural Research Systems, farmers, traders and extension workers, being common actors of the bean value chains in various corridors (Table 41).

TABLE 41: Number of people accessing information (through trainings, printed materials, demos, mass media)

DESCRIPTION	PROGRESS						TOTAL	TARGET	ACHIEVED	% WOMEN
	2015	2016	2017	2018	2019	2020				
People accessing information	43,307	20,084	153,047	2,648,402	36,073,852	3,519,744	42,458436	6,000,000	707%	51.7

TARGET 2015-2020 (b):

70% satisfaction (media type & content quality)

Fourty-eight extensionists (20 women), received training on the use of mobile devices to track implementation of Zimbabwe SDC flagship project activities. The extensionists were drawn from the following districts; Mt Darwin,

Nyanga, Chipinge, Insiza, Shurugwi. Gweru. Kwekwe and Harare head office who had responsibilities for monitoring project activities in the areas of designation, skills and knowledge application almost one year and half after the project initiation. Satisfaction levels on the training content were tested one year following after. 93% are still using their mobile devices for monitoring project activities, while 7% use the audio function on their smart phone devices to send audio reports to supervisors. This is a big change compared to 0% usage in 2018 when paper-based field project reports were common for tracking project implementation.

OUTPUT 4.1.1: Women's participation in research and decision-making bodies of PABRA, and in bean platforms increased/enhanced

TARGET 2015-20:

40% being women in other organizations other than the Steering Committee

Progress: To be able to achieve our target over the years, gender dimensions have been integrated in all trainings; explaining the importance of equal opportunities and amplifying the voices of all stakeholders especially women and youths. From 2015 to 2016, women's presence in leadership positions was less than 20%, with more women as secretary and treasurer. With the introduction of the commodity corridor, and established business platforms we have through gender related trainings increased the number of women in leadership positions. In Rwanda, women hold 47% of farmer organizations/platforms leadership positions while in Cameroon 50% are women and in Zimbabwe 57.1%. Other countries like Burundi, Madagascar and Tanzania are between 35 - 39%. In Uganda, the women representation in platform leadership positions stands 44.5%. Presently, women hold 50.8% of leadership positions across all countries within business platforms, surpassing the 40% target.

OUTPUT 4.1.2: Capacity of bean value-chain actors (National Agricultural Research System scientists /private sector/farmers traders, processors and consumers) to develop, access and use network products including engagement processes are enhanced

TARGET 2015-2020:

100,000 men and women participating in various capacity building initiatives (in degree and non-degree) 50% women; At least one tracer study

Progress: The target was to equip 100,000 men and women in the bean value-chain with skills and knowledge in seed production, crop management practices, breeding, bean business formation and facilitation, gender and project monitoring. In the period 2015-2020, a total of 404,788, which is 404% above the said target were beneficiaries of skills and knowledge, of these 48% were women (Figure 44). The largest category of these were farmer trainees, who receive skills/knowledge during farmer field schools, field days, demonstration plots, and agricultural shows.

We assessed training uptake for two small projects in Malawi where a Peer Group model for promoting information from trainers to beneficiaries using community nutrition volunteers in five districts was used. The specific projects were Malawi Seed Industry Development Project (MSIDP-II) and Adolescent Nutrition-Sensitive Agriculture (ANSA) Project while the training information was on bean processing, preparation and utilisation of various recipes. In this first round of training evaluation the question posed to participants was 'what is your ultimate rating of the knowledge and skills imparted to you through the training'? Results were acquired from Balaka district under MSIDP II project, and from Ntchisi district under ANSA project.Under MSIDP II project, in respect to the 5-point hedonic scale, participants scored overall satisfaction at an average of 4.8 (females scored at an average of 4.7 and Males at an average of 4.6). Under ANSA project, in respect to the 5-point hedonic scale, participants scored overall satisfaction at an average of 4.44 (females scored at an average of 4.56 and Males at an average of 4.21). In Ntchisi district, Under ANSA project, out of the 14 male adolescents who evaluated the nutrition workshop, 78% (57% like very much, 21% like slightly) like the design, length and delivery of the workshop and they said it will likely benefit their nutrition wellbeing. Out of the 25 female, 88% (76% like very much, 12% like slightly).

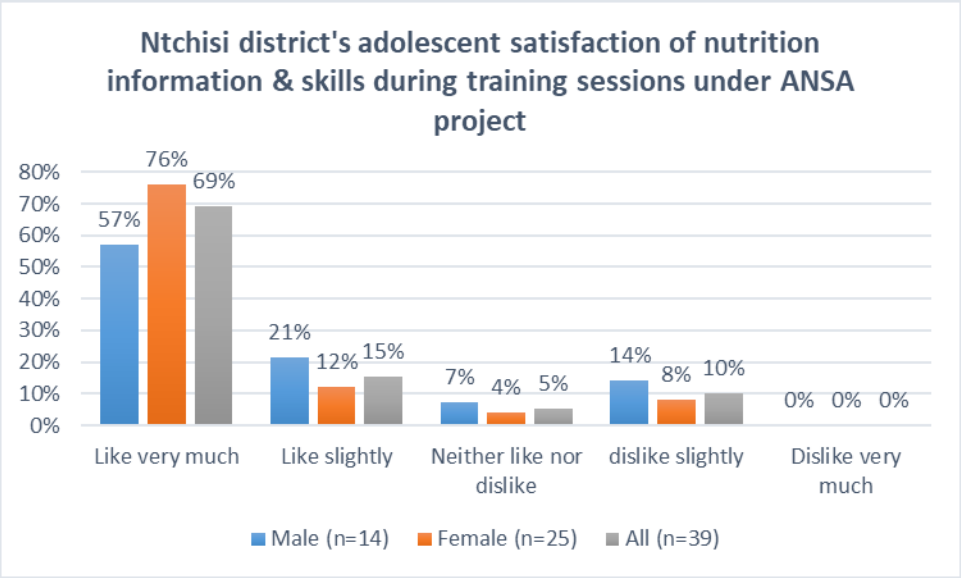

FIG. 44: Training evaluation for Ntchisi district nutrition training

The following could explain the high satisfaction scores by both Care Group members and adolescents; Use of familiar and locally available foods and technics; Use of Care Groups/Peer Groups with community volunteers, which are well known and respected by training participants; Participatory approach in training where frontline workers and participants are given opportunity to take part in the learning process; and Hands-on experience during food processing and preparation demonstrations.

TABLE 42: Number of beneficiaries of capacity building initiatives across PABRA countries (2015-2020)

CATEGORY	2016	2017	2018	2019	2020	TOTAL
National Agricultural Research System/ Partners/Professional programs	79	265	1,882	453	1365	4,044
Farmers (farmer field schools, field days, demo, agric. shows etc.)	9,741	14,527	31,577	101,657	126,397	283,899
Traders (Platforms/Farmer engagements etc.)	3,311	5,547	12,154	4,172	1032	26,216
Extension Workers/Services	584	3,961	8,564	9,797	4471	27,377
Others (Don't belong to above category) and printed materials	5,844	2,113	3,010	3,867	48,418	63,3252
Total	**19,559**	**26,413**	**57,187**	**119,946**	**181,683**	**404,788**
Target 2015-2020						**100,000**
% Achieved						**404%**
% women						**48%**

OUTPUT 4.1.3: Information and Knowledge products responding to emerging related demands in the PABRA network addressed

TARGET 2015-2020:

Three new web-based applications developed; 100% increase in number of users accessing online products (website, blogs, databases; etc.) 100% increase in number of users accessing print and multimedia communication materials (manuals, posters, handbooks, DVDs etc.)

Progress: Online information platforms developed were Facebook and Twitter which registered a social media followership increase of 12% for periods 2019 to 2020. The number of blog posts upload grew from two in 2015 to 25 in 2019 and dipped to 13 in 2020 as a result of COVID-19 effects leading to reduction in field activities. In addition

there were locally administered WhatsApp groups that fostered facilitation of corridor actors actively in Burundi, Kenya, Rwanda, Tanzania Uganda, Zambia, Zimbabwe. More than 350 members were interacting on this platform in 2020. Messages on the WhatsApp groups covered a range of topics, from extension advise at the onset COVID-19 pandemic, onset of locusts and response mechanisms especially in eastern Africa, weather information, information on where to find beans, the prices of beans, information on fairs and agricultural shows, discussions on crop management techniques, post-harvest practice amongst producers and buyers and events and new publications.

One Internal Collaborative Space (ICS) platform – an internal information platform bring together PABRA partners and members from the 32 countries was set up and made available to the PABRA Communication for content upload and roll out to users in PABRA. A site was opened on https://ciatshare.ciat.cgiar.org/sites/pabra/ that allows sharepoint to be transferred from the consultant's developing to the deployment site where it will be managed by the communication team at PABRA, Nairobi. The ICS will have up to date information on PABRA News and events; themes, projects, members, resources and governance.

Between 2015 and 2020, the project supported the development of 183,508 (367% of target) printed information products in the form of banners, brochures, pamphlets, manuals, guides, booklets, posters, leaflets, and flyers.

TABLE 43: Number of printed copies for disseminating information distributed (2015-2019)

2015	2016	2017	2018	2019	2020	Total	Target	% Achieved
1,040	458	25,075	38,832	43,286	74,817	183,508	50,000	367%

OUTPUT 4.1.5 NARS (and value-chain actors) capacity for Monitoring and Evaluation systems are developed inclusively, tested and promoted using Information and Communication Technology tools and in a gender sensitive manner

TARGET 2015-2019:

At least one lead firm representative per target country using digital monitoring platforms

Progress: The emphasis on digitized data monitoring platforms continued with the focus directed to existing digital platforms such as MasterCard Farmer Network (MFN) to access data on organized markets, e-collection services and e-payment. The MFN platform was scaled out to additional districts in Eastern Uganda and Western Tanzania, proving the MFN application is particularly useful for tracking data on several variables where offtakers, input providers and extension service providers are engaged. Between 2017 and 2020, over 300 agents were trained on tracking field operations in areas such as; digitally onboarding new farmes, digital collection of produce, and entry of service requests for seed and inputs. The data and information captured informed the activities reported under the market outcomes of this report.

FIG 45: PABRA staff training agent on the MFN platform(left) and right farmers being registered onto the platform.

A PABRA staff (in blue) instructing a community agent (Christine in orange) through a refresher session on how to register farmers on the MFN e-collection and payment platform on the mobile phone

Christine (the community agent in orange) explaining to farmers in Karamoja district the steps of registering their produce and grain sells to the mobile based e-collection and e-payment platforms.

CROSS-CUTTING ELEMENTS

Strategic Gender Research (Reach, benefit and empower)

Deliberate efforts have been made to mainstream gender equality at all levels within the program and externally with private-public partners like the National Agricultural Research Systems (NARS). The interventions included: (1) To enhance women and youth economic empowerment; 2) Engage men in nutrition activities 3) Build the capacity of researchers and partners to mainstream gender; 4) Build capacity of men, women, and youth to increase productivity, income and develop enterprises on beans; 5) Develop a robust monitoring and evaluation system that integrates gender analysis and monitors gender indicators in the project cycle. Several accomplishments have been achieved across various PABRA member countries- these included among many:

1. Three gender-specific labor-saving technologies including the use of herbicides for weed control, planters and multi-crop threshers were validated.
2. NARS in partners with the Alliance of Bioversity International and CIAT have been building the capacity of young farmers in seed and grain production, mechanization and market linkages (Engaging Kenyan youth in bean business to boost income - (pabra-africa.org).
3. In Eswatini, bean jam was promoted by Smiling Through Investment, a youth enterprise (see World Pulses Day 2021: Counting on beans for healthier diets and planet - (pabra-africa.org). Across PABRA, bi weekly virtual training sessions for young breeders and breeding technicians has been ongoing for the past six months, touching on various aspects of breeding and experience sharing between senior (experienced) and junior breeders.

Monitoring, Evaluation Social Learning

Monitoring Evaluation and Learning was decentralized through themes. Each thematic focus within the PABRA team assigned a focal person to support monitoring of the project at country level. PABRA hired a new data analyst to support data collection and analysis at thematic level and analyze draw lessons.

Support to digitized data capture and data processing in selected countries continued. National bean team leaders played a coordination role, ensuring data and information from key implementing partners were available for reporting, planning and reflection. In 2020, multiple surveys were carried out in the year to determine user perspectives on services and products promoted by the project. Alchemer (previously SurveyGizmo) a commercial survey platform was acquired to help run surveys efficiently using its digital platform and analytical tools. A survey on impact of COVID 19 to farmers, aggregators, processors, national research institutions, and Small medium enterprises was carried out between March to August using this platform. Alchemer (previously SurveyGizmo) was administered through e-mail, and phone contact and follow up focus group discussions. In Malawi, Alchemer was proposed as an alternative survey platform to run a tracer study on skills and knowledge promoted to trainers of trainees(ToTs) under a nutrition project as well as to understand the impacts of the project to beneficiaries. Lime survey is another commercially available survey platform that was promoted in Zimbabwe where it was used to run a study that is assessing the promotion of digital tools for regular monitoring.

With the onset of COVID 19, travel restrictions and border closure were imposed in most countries, PABRA was agile and took advantage of online interactions. Virtual meeting both internal and external with partners were conducted through Microsoft Teams. Some of these virtual PABRA forums include: Southern Africa Bean Research Network (SABRN) Steering Committee meeting 8-10 Dec 2020; West & Central Africa Bean Research Network (WECABREN) Steering Committee 15-17 Dec 2020; Private Sector Partnership meeting held in September 2020; Inclusive Bean Trade for income and nutrition security in Africa: Focus on Zambia held on 23-24 Nov 2020; Weekly Breeders Webinars on demand led breeding and seed system groups.

Due to COVID-19 pandemic restrictions, most partner activity implementation were backstopped virtually, both in country and across PABRA countries. Online platforms such as WhatsApp groups were used in programme continuity. Virtual workshops were also held between PABRA and respective country research, extension and key value chain actors. Virtual extension services were also supported during this time. In Burundi, Ethiopia, Kenya, Malawi, Rwanda, Uganda, Zambia and Zimbabwe agronomy, seasonal climate advisories and market information were provided at both national and regional levels. The social media platforms provided spaces for farmers and value chain actors to interact, learn and support one another.

Stories/updates from the field

Market-focused technologies as entry point and incentive for adoption

Successes may be reported through the varieties that have been released this year. Twenty-four client demanded varieties were released in six countries. Fifteen (15) of the varieties were released because they were responsive to various stresses, while nine (9) were for nutrition – HIB (Table 22). The released varieties fall into six prioritized product profiles; large mottled (6), large reds (4), small white (4), small reds (3), sugars (2) and purple/*kablakenti* (1) (**3 unknown) across the three countries.

TABLE 44: Varieties released in 2020

COUNTRY	# OF VARIETIES RELEASED	VARIETY NAME	GROWTH HABIT	MARKET CLASS	FINAL USE
Botswana	3	CAL96	Bush	Large red mottled	High yielding
		DAB541	Bush	Large red mottled	High yielding
		GK012 (Tepary bean).	Bush	Small white	Heat tolerance
Tanzania	6	RCB 593 (TARIBEAN1)	Bush	Small red	Drought tolerant
		SCR 61 (TARIBEAN3)	Bush	Small red	Drought tolerant
		KAB06F2-8-36 (TARIBEAN5)	Bush	Large red mottled	High yielding
		SMC 18 (TARIBEAN2)	Bush	Small white	Biofortified
		COD MLB 033 (TARIBEAN4)	Bush	Large red	Biofortified
		RWR2154 (TARI19)	Bush	Sugar bean	Biofortified
DCR-East	15	RWR1668 (Kinja/ Mwizarhahenda)	Bush	Large red	Disease (CBB, anthracnose, HB, ALS) resistance
		Munyama (Tokachini/ Democratia)	Bush	Large red	Disease (CBB, anthracnose, HB, ALS) resistance
		HM21-7 (Afranka/Zirimo)	Bush	Large red mottled	Biofortified
		NABE 4 (Nambiyo Mbiyo)	Bush	Medium/large red mottled	Disease (CBB, anthracnose, HB, ALS) resistance
		SER80	Bush	Small red	Drought tolerance
		NUA45 (TSHIBINGU 3)	Bush	Large red mottled	Biofortified
		Tuta	Climber	Large cream	Multiple resistance
		Prelon	Bush	Small white	Multiple pest and disease resistance
		RWR2154	Bush	Sugar	Biofortified
		Cuarantino	Semi climber	Small white	Biofortified
		RWRV1129 (Balihamwabo)	Climber	Kablanketi	Biofortified
		Binja (Sawasawa)	Climber		Multiple pest and disease resistance
		Kipendwa (Mushagalusa)	Climber		Multiple pest and disease resistance
		NUV 131-1 (Majonjo/Masese)	Climber	Large red	Biofortified
		CODMLV096 (Pendeza)	Climber		Disease (CBB, anthracnose, HB, ALS) resistance

Seed revolution in Eastern DRC, from free seed and seed payback systems to pursuing marked options to access quality of improved seed from seed entrepreneurs

Seed system in DRC is predominantly informal and unstructured. For years, farmers have received free seeds from government seed operations and relief programmes. This year, PABRA in collaboration with Harvest Plus and seed entrepreneurs introduced market options to supply seed and test farmers' willingness to pay for quality seed. Particular emphasis has been made to strengthen the involvement of entrepreneurs to ensure the sustainability. During the sensitization and marketing campaign conducted between August and September 2020 (see Fig. 46), three seed entrepreneurs sold 5. 5 tons of beans seed and 4.65 tons of maize seed which were sold to 4703 farmers (3364 men, 1339 women) in the districts of Kabare, Idjwi, Kalehe and Walungu of South Kivu Province. To ensure smallholder farmers afford to purchase, the seed were packed in small pack size of 2kg and 5kg and the price per kg was 1 USD for maize and bean seed was 1.5 USD.

FIG. 46: Seed sensitization and marketing campaign in Kabale District South Kivu Province

Using the results, PABRA is putting together a policy brief and partnering with other development partners to initiate the demand led seed systems through market options**.**

Nutrition intervention training organized by PABRA- the Alliance in partnership with EADCL.

In November 2020, PABRA in partnership with Eastern Agricultural Development Company Ltd (EADCL), organized a training to create awareness on the nutritional benefits of NAROBEAN 1 – a biofortified bean variety to smallholder farmers in Teso and Karamoja regions of eastern Uganda. The training- a first of its kind in the region was conducted in three districts of Serere, Amuria and Abim where EADCL has community operations and partnership. In all three districts, the nutrition team demonstrated preparatory and sensory evaluations of the porridge prepared using iron rich NAROBEAN 1 composite flours to five farmer groups.

Sensory evaluations determined farmers' response to the bean's fast cooking and taste attributes for both fresh and dry bean types. It was observed that all participants in the regions liked the porridge and showed willingness to prepare it at home. Precooked beans were another bean based product under development by EADCL. The beans undergo dehydration and packaged before selling to consumers. These beans are incredible for their benefits in cutting down costs of fuel consumption that is required to prepare beans. The EADCL company has ventured into value addition of bean enriched foods by establishing a milling, precooking, roasting and packing sections for the business growth.

FIG. 47: The group from Adea village listening to the welcome remarks from farmer agent and MD-EADC (A), Trainer explaining the benefits of iron rich beans to the farmers (B), Happy mothers feeding their babies with porridge (C and D).

Determining cooking time of tepary beans

Botswana released the first variety of tepary beans (Phaseolus actifolius) accros PABRA. Though not popular as common bean (P. vulgaris), tepary beans is more adapted to very hot, dry and salty environments (see Fig . 48). It has a potential to enhance farmers' resilience to climate change.

FIG. 48: Tepary Bean grain and plant.

Cooking quality is key in determining the energy cost for preparation of beans and information can be useful in varietal selection for breeders and consumers. Tepary beans that was prepared in Figure 49 after soaking in water took approximately 70 minutes to be ready after testing for softness. While the other sample that was not soaked in water and cooked in the electric stove took 150 minutes to cook through. The cooked sampled of tepary beans were tasted by 28 panellists, provided. The results show that majority of respondents liked, liked very much or extremely liked the cooked tepary. None of the respondents was undecided nor did not like tepary beans taste. These are promising results which shows that tepary bean could be further explored into different products to increase its marketing and wider production in Botswana.

FIG. 49: Three samples of tepary bean used in water absorption preliminary studies. Cooking tepary bean on fire (middle) and on cooking stove (right) to observe the cooking time

TABLE 45: Projects complementing the sdc project contribution in 2020

	PROJECT NAME	FUNDING PARTNER	COUNTRIES	COMPONENTS
1	**Malawi Seed Industry Development Project Phase II (MSIDP II)**	ICRISAT-International Crops Research Institute for the Semi-Arid Tropics	Malawi	Seeds, agronomy, gender, food and nutrition
2	**Improving Bean Productivity and Markets in Africa (IBPMA)**	Global Affairs Canada (GAC)	Kenya, Tanzania, Zambia, Malawi, DRC, Uganda, Ethiopia, Madagascar, Rwanda, Mali, Burkina Faso, Togo, Senegal, Ghana, Cameroon, Guinea Conakry, Central Africa Republic and Ivory Coast	Demand led breeding; small holders' market participation and private sector development, Gender, Sustainable production/ Climate Change, Food and nutrition Security
3	**Technologies for African Agricultural Transformation (TAAT)**	IITA-International Institute of Tropical Agriculture	Kenya, Malawi, Rwanda, Zimbabwe, DRC, Burundi, Uganda and Tanzania	Seed systems, agronomy, private sector investment, technology adoption
4	**Supporting Seed Systems for Development (S34D)**	Catholic Relief Services (CRS)	Kenya, Democratic Republic of Congo (DRC) –Eastern	Seed systems development gender, seed market and private sector development
5	**Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA)**	ICRISAT-International Crops Research Institute for the Semi-Arid Tropics	Uganda, Ethiopia, Tanzania	Demand Led Breeding, seed systems, gender
6	**Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA)**	ICRISAT-International Crops Research Institute for the Semi-Arid Tropics	All PABRA Countries	Demand Led Breeding, seed systems, gender
7	**Support for the implementation of Regional Integration of Research Centers and Regional Coordination - 'L'appui a la mise en oeuvre de L'integration Regionale des centres de Recherche et a la Coordination Regionale**	IITA-International Institute of Tropical Agriculture	DRC-Eastern	Seed, nutrition and food basket approach (Higher iron beans and Provitamin A maize)
8	**Rapid Cooking Breeding Project**	University of West Australia	Uganda, Ethiopia, Tanzania and Rwanda	Pre-breeding and breeding for short cooking and climate-smart bean, seed systems, energy efficiency, gender and market development
9	**Demand-led plant variety design for emerging markets in Africa**	University of Queensland	Kenya	Demand led breeding, policy and institutional influence, market development
10	**DeSIRA Project**	CIP-International Potato Center	Malawi	Seed Systems
11	**Bean Enhance**	University of Cambridge	Uganda	Bean breeding

	PROJECT NAME	FUNDING PARTNER	COUNTRIES	COMPONENTS
12	**KULIMA Promoting Farming in Malawi: Improving the access to and use of agriculture research innovations by Malawian farmers**	CIP-International Potato Center	Malawi	Research Innovations and technology transfer
13	**Scale up of Pre-cooked Beans for Food Nutrition Security by leveraging on Public-Private partnership in Kenya and Uganda (CultiAF-II)**	International Development Research Centre (IDRC)	Kenya and Uganda	Scaling up production, nutrition, gender and public private partnership
14	**Feminization, Agricultural Transition and Rural Employment: Social and Political Conditions of Asset Building in the context of Export-led Agriculture (FATE)**	Swiss National Science Foundation	Rwanda	Gender, rural employment and economic empowerment

EMERGING OPPORTUNITIES

Bean corridor approach – an opportunity for rural transformation through women owned rural bean enterprises

The Bean corridor approach model has continued to provide opportunities for building rural bean enterprises and services that benefit bean producers. Beans are increasingly attracting investment along the value chain in eastern and southern Africa. Private sector firms are confident to invest in new bean based products and new processing facilities due to the increasing transparency of support structures provided by bean corridors and bean business platforms. Women are coming up as investors in the processing industry. The investors include women that under regular conditions were mainly focused on farm production leaving downstream activities to men. PABRA's corridor models is thus supporting intensification of bean production, distribution and marketing and consumption activities (PABRA 2017). More than 10 countries now have bean processing activities, an increase from only 4 or 5 years ago. The number of new bean products have also increased from only one to more than 5 due to these investments. The model is reorienting and increasing structured trade in bean and bean products by systematically reducing production bottlenecks including access to quality seed of consumer demanded varieties and ultimately satisfy the consumer demand. PABRA's role in the corridor continues to provide technical and strategic guidance to the implementation of the commodity corridors initiatives and continually to build partnerships and capacity that will generate more impact among the smallholders.

Digital Financial inclusion in agriculture – MasterCard Farmer Network Experience

Buyers of agricultural produce in Africa predominantly use cash to secure produce from smallholder farmers. The adoption of mobile phones has significantly increased innovations and the possibility for cashless transactions in Africa. Introduction of seamless transaction with non-cash payments is an avenue for cutting transactions costs for both the buyers and sellers. It also facilitates the linkage to other financial intermediaries such as banks and microfinance institutions. Digital payment services continued to be deployed in Uganda and Tanzania via MasterCard Farmer Network a collaboration between PABRA and MasterCard. The focus in both countries was to deepen usage

of MFN by producers and SMEs. The efforts continued with KADERES in Tanzania and in Uganda, with CEDO and EADC. A major objective was to raise the level of participation of women as agents of the services and incomes for women producers. From the 270,000 registered producers in both countries, usage rose as demonstrated by transactions that were conducted through MFN. During the period, value of transactions increased to about USD 5 million from USD 1 million in the previous year for both bean and coffee. The number of transactions also increased twofold o more than 5,000. Where women's participation is restricted by ownership of land, the women are being supported to establish production groups in order to increase their participation in the produce trade. Women were also supported to enrol as MFN agents to increase their benefit from MFN (via commission fees). PABRA expects to continue deepening usage of MFN in order to double usage but also to introduce MFN to more countries such as Rwanda in the next year.

Increase the participation of women and youths in the bean value chain

Though women and youth are increasingly participating and benefiting from the various nodes of the bean value chain (Fresh bean grain business in Tanzania; a new hope for youth and women - (pabra-africa.org); Graduate scaling great heights growing climbing bean for fresh pod market in Uganda - (pabra-africa.org); Youth agri-entrepreneur transforming his community through job creation in Tanzania - case of Pastory Tarasisi - (pabra-africa.org) more still needs to be done _. Women and youths are still constrained by access to finance for farm operations, ownership of land, mobility, mechanisation and high workloads particularly in some communities. The Maasai pastoralists in the Simanjiro districts, Mayara region in Tanzania are now diversifying their source of livelihood by engaging in agricultural production to complement livestock farming. The adoption of cultivation by the pastoral Maasai community is widely practiced to diversify their diets (Common Beans: The Greener Pasture for Northern Tanzania Pastoralists - (pabra-africa.org). Even though, different initiatives have promoted the production and dissemination of quality seed, the pastoralists still face the challenges such as access to technical skills and chemicals. Women seems invisible in this community as they are only seen to provide unpaid labour. Findings from the field show that women fall short of qualifying as beans producers due to lack of land ownership and initial resources to invest in beans production operations. In addition, women mainly provide labour on the farm.

An opportunity arises thus to increase women and youth participation in bean production and marketing. A proposed approach is being tested in Simanjiro district in partnership Maasai women (25) and elders, District council, Nafaka (bean aggregator), Crop Biosciences (private sector mechization service provider), TARI- Selian and Alliance-PABRA. Developing gender-responsive product profiles across PABRA countries.

The introduction of the demand-led breeding approach meant interrogating how we do breeding, finding out the gaps, and proposing the appropriate way forward. Different trainings have been carried out to explain this approach to breeders, social scientists, and other value chain actors. The Alliance and 10 countries have developed demand led breeding strategies including market segmentation, product profiles. NARS breeders have mainstreamed the engagement with the value chain actors in the design of the varieties. This has contributed to the development and release of the farmer demand and market demanded varieties, increased adoption and commercialization of improved varieties across many PABRA member countries. Through the demand led breeding project, PABRA is teaming up with other CGIAR centres, several Universities in Africa, University of Queensland and the Syngenta Foundation for Sustainable Agriculture to expand the breeding approach to other commodities.

LESSONS LEARNT

Seed revolving fund in Kenya

In Kenya, we started a seed revolving fund with the Ushirikiano women's group in September 2019 with 340 kg of certified Nyota seed. From the 2020 to 2021 season, there has been an increase in the number of women members from 80 to 93. The volume of grain produced increased from 10.1 tons in 2019/2020 to 63.9 tons in 2020/2021. The volume of grain sold to a women-owned aggregator and processor, Smart Logistics, increased from 5 tons in 2019/2020 to 32 tons in 2020/2021. While the farmers were getting a premium price of Kenya Shillings (KES) 67 per kg in 2019, it increased to KES 70 78 (US$ 0.78 70) per in 2020. The increase of KES16 (USD 0.16) compared to what they got through grain brokers and local traders.

Importance of partnership

This year we partnered with Cornell University and the Makerere University to build the capacity of the NARS partners from West and Southern Africa to address the priorities of both women and men through inclusive and effective agricultural systems in sub-Saharan Africa (SSA). The Gender-responsive researchers equipped for Agricultural Transformation (GREAT) course is virtual this year, and we had 12 social and natural scientists participating from Malawi, Senegal, Zimbabwe, Zambia, Eswatini, and Mozambique. This virtual course is from 8th-16th March and 18th-22nd March 2021. The course focuses on crop breeding and intends to integrate gender in breeding activities across the different countries. These colleagues will help out in producing gender responsive product profiles in the different countries where they are based.

Information and knowledge sharing

Publications –articles, book chapters, conference papers, research reports, blogs, posters, flyers

Capitalizing on digital tools to sustain bean production, trade and consumption amidst COVID-19
https://www.pabra-africa.org/capitalizing-on-digital-tools-to-sustain-bean-production-trade-and-consumption-amidst-covid-19/

Common Beans: The Greener Pasture for Northern Tanzania Pastoralists
https://www.pabra-africa.org/common-beans-the-greener-pasture-for-northern-tanzania-pastoralists/

Graduate scaling great heights growing climbing bean in Uganda
https://www.pabra-africa.org/graduate-scaling-great-heights-growing-climbing-bean-in-uganda/

Fresh bean grain business in Tanzania; a new hope for youth and women
https://www.pabra-africa.org/fresh-bean-grain-business-in-tanzania-a-new-hope-for-youth-and-women/

Youth entrepreneurship in the bean value chain - nutritious precooked food to mechanization service provision
https://www.pabra-africa.org/youth-agri-entrepreneur-transforming-his-community-through-job-creation-in-tanzania-case-of-pastory-tarasisi/

Regional impact of COVID-19 on the production and food security of common bean smallholder farmers in Sub-Saharan Africa: Implication for SDG's: https://www.sciencedirect.com/science/article/pii/S2211912421000341?via%3Dihub

Promoting nutrition strategies to cope with COVID 19 in Lesotho
https://www.pabra-africa.org/promoting-nutrition-strategies-to-cope-with-covid-19-in-lesotho/

Little spaces promise more food and nutrition security for households in Kenya
https://www.pabra-africa.org/little-spaces-promise-more-food-and-nutrition-security-for-households-in-kenya/

Immediate impacts of COVID-19 pandemic on bean value chain in selected countries in sub-Saharan Africa
https://www.researchgate.net/publication/347736814_Immediate_impacts_of_COVID-19_pandemic_on_bean_value_chain_in_selected_countries_in_sub-Saharan_Africa

Food Security and common bean productivity: Impacts of improved bean technology adoption among smallholder farmers in Burundi https://www.researchgate.net/publication/348944093_Food_Security_and_common_bean_productivity_Impacts_of_improved_bean_technology_adoption_among_smallholder_farmers_in_Burundi

Biofortified Beans: A vehicle for improving Nutrition, Income and Food Security in Burundi https://www.researchgate.net/publication/349836146_Biofortified_Beans_A_vehicle_for_improving_Nutrition_Income_and_Food_Security_in_Burundi

Transforming Africa's agriculture through enhancing commercialization of agricultural research products: The case of high iron beans technology- https://cgspace.cgiar.org/handle/10568/111559

Getting biofortified beans on plates of school children -https://cgspace.cgiar.org/handle/10568/109770

PABRA means partnership: Transforming agriculture in Africa together https://cgspace.cgiar.org/handle/10568/113037

Kijitabu cha kufundishia wakulima wadogo wa Maharage wa nyanda za juu kusini mwa Tanzania. Pan-Africa Bean Research Alliance (PABRA); International Center for Tropical

Kato, F.; Kabungo, D.; Kilango, M.; Maganga, R.; Magelanga, A.; Lwehabura, J. & Rubyogo, J.C. (2020).

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Katungi E; C. Larochelle, J. Mugabo and R. Buruchara (2019) Climbing bean as a solution to increase productivity in land-constrained environments: Evidence from Rwanda. Outlook on Agriculture 2019, Vol. 48(1) 28–36 (https://doi.org/10.1177/0030727018813698)

PABRA won 2019 Al Sumait Prize award in recognition of their contribution towards food security in Africa. Beans better for Africa under PABRA was the 50 Great Research Innovation of the CGIAR.